Owners Satisfaction with Consultancy Practices in Saudi Arabia

by

Ahmad Ismail Al-Musallami

A Thesis Presented to the

FACULTY OF THE COLLEGE OF GRADUATE STUDIES

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DHAHRAN, SAUDI ARABIA

In Partial Fulfillment of the
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This thesis written by **AHMAD ISMAIL AL MUSALLAMI** under the direction of his Thesis advisor and approved by the Thesis Committee has been presented to and accepted by the Dean of the College of Graduate Studies, in partial fulfillment of the requirements for the Degree of **MASTER OF SCIENCE IN CONSTRUCTION ENGINEERING AND MANAGEMENT.**

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خلاصة البحث

الممارسات المهنية للمهندسين الانشائيين
في المملكة العربية السعودية
ومدي تحقيقها لمتطلبات الملاك الحكوميين

يتناول هذا البحث العلاقة المهنية القائمة بين المكاتب الاستشارية الهندسية المحلية وبين الملاك الحكوميين وهم الجهات الحكومية الذين نفذوا أو ينفذون مشاريع مباني انشائية . يقوم البحث بالتعرف علي طبيعة الخدمات الهندسية التي يقدمها الاستشاريين المحليين ودرجة رضا الملاك الحكوميين عن هذه الخدمات وذلك عن طريق استبيانين احدهما شمل كافة المؤسسات الحكومية المعنية والآخر تناول عينة من المكاتب الاستشارية الهندسية في كل من الرياض وجده والدمام .

استخدمت المؤشرات الرقميه بشكل رئيسي في تحليل البيانات وقياس الخصائص المتعلقة بالإستشاريين المحليين والملاك الحكوميين ودرجة رضا الملاك الحكوميين عن الخدمات الهندسية المهنية المقدمة لهم من حيث الأداء الوظيفي والجمالي والاقتصادي وامكانية الانشاء . وقد خلص البحث الي أن درجة الرضا متوسطة وذلك لاسباب يرجعها الملاك الحكوميين الي ارتفاع نسبة أوامر التغيير الناجمة عن أخطاء في التصميم وتأخر الاستشاريين في اعداد التصاميم وعدم شمول الخدمات التي يمكن للإستشاريين تقديمها ، ويرجع الاستشاريون درجة الرضا هذه الي عدم مشاركة الملاك الحكوميين الفاعلة في مرحلة التصميم وعدم طلبهم للحد الضروري من الخدمات الاستشارية وقصور في الوعي لاهمية دور الاستشاري ومدي جاهزيتهم لدفع الاتعاب الكافية للخدمة الهندسية الشاملة .

THESIS ABSTRACT

BY: AHMAD ISMAIL AL MUSALLAMI

CONSULTANCY PRACTICES IN SAUDI ARABIA AND PUBLIC OWNERS SATISFACTION

MAJOR FIELD: CONSTRUCTION ENGINEERING AND MANAGEMENT

DATE: April, 1992

This research deals with the professional relationship between the public owners and the local Architectural Engineering A/E firms in Saudi Arabia. It explores the current practices of the local A/E firms. It assesses the degree in which these practices are capable of fulfilling the public owners needs in building construction projects. The data was obtained from a sample of local A/E firms in Dammam, Riyadh, and Jeddah and from the entire population of the public owners via two questionnaires. Indexes were used extensively to measure the A/Es and public owner characteristics and satisfaction level of the A/E design services in terms of function, aesthetics, cost effectiveness, buildability, and overall satisfaction. In conclusion, the public owners satisfaction level of the local design services is moderate mainly due to: high percentage of change orders originating from design errors, owners demanding less than the needed scope of services, and the A/Es delay in completing design as declared by public owners. The A/Es attribute Dis-Satisfaction to the low level of owners involvement in the design, their perception of the A/E role, and their readiness to pay a reasonable fee and demand the right scope of services.

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CHAPTER ONE

INTRODUCTION

1.1 General

The engineering Consultancy service can be referred to as the professional advice offered by the Architectural Engineering (A/E) firm in return for money (J. P. Jones, 1988). It evolved in Europe and USA as an independent profession in the second half of the 19th century. Ever since, it has been characterized as a growing and dynamic industry. The long years of practice together with the social, economical, and other systems in Europe and USA shaped up the consultancy industry and produced it's norms and regulations. There has been intercultural changes in the consultancy profession through out the globe with the prosperity of international trade. This is due to the fact that no local industry can afford not to think and act in a global sense as a mandatory requirement for survival. This fact applies almost to all disciplines.

In Saudi Arabia engineering consultancy evolved in a relatively short period of time - within the last twenty years (Ministry of Finance, The Statistical Year Book 1989). It's

profile is synonymous to that of the construction industry which witnessed a great growth rate in the seventies and early eighties. Within that period the country infrastructure was built. The projects were huge in size and complexity (ARAMCO, Trends In The Construction Industry, 1980). The expenditure on the 3-development plans (1970 - 1985) amounted to SR. 1940 Billion. Almost all mega projects were designed and built by multinational architectural engineering firms.

During the eighties, the local architectural engineering A/E firms started to enter the market by the second generation of national graduates. The mega-projects were almost completed. They were beyond the capacity of local A/E firms. The government policy was to segment these huge projects so they become manageable by local A/E firms in a step to encourage the private sector participation (Mansouri, 1987). Such actions helped maintain a steady development level after the slow down in construction growth due to the drop in oil revenues.

1.2 Statement of The Problem

The short practical life and the fast economic and construction boom gave little time for the local consultancy industry to establish it norms and regulate its practice. However, there have been some efforts to generate data and

address practical problems in the local industry.

In general, research is limited on the local consultancy practices, and the interface between the participants in the construction industry at large. More research in this area shall lead towards building a technical, regulatory, and managerial data base for the consultancy and construction industries. Such data base can help determine potential problems in the industry practice. Detecting these problems is necessary as a first step towards dealing with them. This research contributes to the above direction by addressing some issues relating to the consultant / public owner interaction.

Previous research pointed out some problems associated with the reliance on foreign A/E firms in design and construction (Zahlan A.B., 1984). Communication barriers and foreign A/E disability to satisfy social and cultural requirements in the design were common problems. Furthermore, there was little technical background on the competency and performance of the materials and systems to fit the environmental conditions in the Kingdom. With the local A/E gradual taking over, some of the above problems supposedly should be reduced. However, independent research only can verify the current status of engineering consultancy practice and the degree in which local A/E firms are capable of fulfilling clients' needs and requirements.

The users of local consultancy services are; Public (Governmental), Semi-public, or Private (corporate owners and individuals). They all have common objectives to fulfill in the design of their projects. The role of the A/E is to help his clients in defining and achieving these objectives. Client's objectives can be summarized in three wards: good quality, low cost, and rapid completion time.

However, it is a well established fact that owner's objectives are partially mutually exclusive. Therefore, owners should accept compromise or a trade-off between these objectives. Owners need to define their priorities in terms of cost, time and quality at the briefing period. Their objectives need to be spelled out in terms of clear requirements that the A/E is responsible to meet in the design. The A/E is considered successful in his job to the degree in which he fulfills these objectives while maintaining a professional level of conduct with his client(s).

This study examines the current trends in the A/E services; the scope of services and the potential to expand it to include services beyond basic design such as construction management, value engineering, and pre-design services....

Furthermore, it examines the public clients involved in the construction industry, their profile, and the degree their needs are satisfied by the local consultancy services.

The research problem is stated as follows:

"The purpose of this research is to explore the current engineering consultancy practices and to assess the degree in which these practices fulfill public client's needs in building construction projects in Saudi Arabia".

1.3 Research Objectives

This research deals with the professional relationship between the public owners and the local A/E firms and examines the current A/E practices affecting this relation. It will necessarily provide vital information to the benefit of all parties involved in the building industry. The following are the questions to be answered by the research:

* What is the status of the current services ?
* What services are demanded most by Clients ?
* What are the unmet needs of public clients?
* What are the problem areas in the public client A/E relation ?
* Are the public owners satisfied with the consultancy services ?

1.4 Significance of the Study

Academicians, engineering consultants, practitioners, clients, and contractors shall find this study significant. Understanding the current engineering consultancy practices and the degree to which they satisfy clients' needs will lead to:

* Raise the clients' level of appreciation to the consultant role resulting in achieving overall project success.

* Help bridge the gap between design and construction. This can be achieved by disclosing the possible interface problems between the designer and the user of consultancy services.

* Can help engineering consultancy in increasing their business opportunities by tackling unmet needs and expanding their involvement.

* Promote the need for more adaptability from the side of consultants to accommodate themselves to changes in the profession.

* Raise questions to be answered by further research studies in the subject matter.

Furthermore, the engineering consultancy services have been overlooked by some owners. this can be observed clearly at the level of individual owners as well as some corporate ones. Some A/Es tend to satisfy their clients by giving them what they expect and think is correct in terms of technical

decisions and choice of systems. The A/E should always provide the correct professional advice to his client even if he has to go through some explanations and persuasion (Jones, 1989). This has been a strong personal drive for the researcher to explore the A/E owner relation.

1.5 Scope and Limitations

For the purpose of this study the following limitations were made:

1. The engineering consultants A/E firms involved in the research are limited to those operating in the three major cities of Dammam, Riyadh, and Jeddah. This is due to the fact that they represent the majority of A/E firms operating in the Kingdom.

2. The study deals with public clients who are eligible for a share of public fund allocation for projects, and have constructed or currently constructing building construction project(s) using the services of local consultants. They are listed in the Ministry of Finance Publication (Statistical Year Book 1989). The study was limited to public clients because of time and resources constrains.

1.6 Organization of The Thesis

The research is naturally divided into two sub-problems; (1) exploratory study of the current A/E services and involvement in the industry, and (2) determining and verifying the level of satisfaction amongst public clients in terms of their need fulfillment and actual performance of their projects. Therefore, the thesis was organized to fit the above subdivision. The following is a brief description of the content of each Chapter:

Chapter One: Introduction

General introduction about the engineering consultancy and the A/E role. Definition of the research problem. The research significance, scope, limitations, and objectives.

Chapter Two: Literature Review

Review of the relevant literature in the broad sense of engineering consultancy / owner interface. The role of the design phase in producing a successful project. Issues relevant to consultancy practice in the Kingdom and the A/E client relation. Analysis of the local consultancy industry, project delivery systems, multinational A/Es operating in Saudi Arabia, And a guideline for the use of consultants.

Chapter Three: Research Methodology

Definition of the research plan, and the required data. Operationalization of constructs. Establishing the data collection tool, method(s) of data collection, respondents , and data analysis techniques.

Chapter Four: Results and Analysis

Documentation of the data obtained from the two populations; the local Architectural / Engineering firms, and the local owners. Their characteristics, profile, services, projects, and interaction. Indexes are used extensively to measure the above attributes. The chapter focuses on the satisfaction of public owners from the A/E as well as the public owner himself. Alternative measures are established to validate response and measurement.

Chapter Five: Summery and Recommendations

Brief description of the research course of work in achieving the research objectives. Discussion of the most significant findings regarding owners' A/Es relation. Recommendations of possible measures to improve public owners satisfaction of the local A/E services.

CHAPTER TWO

LITERATURE REVIEW

2.1 The A/E Client Relation - General

Consultancy refers to the professional help provided to the client in return for a fee, during which the A/E has certain powers and liabilities (Jones, 1988). The A/E client relationship should be based on mutual trust and confidence. On the other hand, the A/E should exert every possible effort to act as an agent, and advisor to the client probably in a similar manner as the doctor views his patients.

Ideally, the A/E is not just somebody who makes designs. He is usually involved in deciding and achieving the best solution to all of the client's requirements and interest.

This may require feasibility studies before design begins. The design must not only be aesthetically satisfactory but also satisfy the need for it, and give an optimum balance between initial costs and future life costs. The client will expect the A/E to advise him in, and arrange for bids. Then to suggest a suitable contract for construction. Supervision

of the building process to ensure quality, and control cost. Finally the client will expect to have his building ready on time, built to the best standards, free from future maintenance problems and at no extra cost to the sum first estimated at the design stage.

A good design:

* Meets the basic owner requirements.
* Is functional, aesthetically pleasing.
* Is cost effective to acquire, own and operate.
* Is well coordinated and readily biddable."

(Garret, 1985).

The A/E is entitled for a reasonable fee to enable him carry out the above duties. The client should realize the A/E role in achieving overall project success and be ready and welling to pay for the services.

The A/E is liable for the client for any negligence in the design, or the finished building being unfit for its purposes, or in cost advice, contract advice and supervision. In general the A/E should fulfill the client's needs. However, these needs might not all be fully satisfied due to the owner himself (K. Y. Medallah, 1989).

The client's duties were outlined by one study (B. J. Hodgon, 1980). The client should fulfill these duties himself

as mandatory requirements for project success.

"The client must: Make basic firm decisions during the initial briefing period, Make every effort to understand he is being told and what his initial decisions mean, Realize that the pre-costing of building is not an exact science, Be closely involved during design stage and make further decisions as design develop, and Approve the cost plan at the end of design stage with a full understanding of what he is approving." (Pszenicki,1980).

The above reinforces the proposition that client's input and participation should never be overlooked in determining and fulfilling his own needs.

The AIA manual of professional practice outlined the following duties of the client that shall help A/E reach at a successful solutions to client's needs:

"The owner should:

* clearly state his requirements
* furnish the A/E with full legal, utility, and physical information about the building site.
* enter with A/E into a formal detailed agreement stating all conditions relating to the project..
* give full attention and consideration to documents prepared and presented by A/E".

Clients has the right to question the A/E ability to meet their needs in the total sense, and to get the best possible value for their money in terms of cost, quality and time. The A/E duties are to help the client in achieving his targets.

The question is: Do the A/E work to the quality expected. Does he really care about protecting the client's interest in the widest sense of the word, including proper site investigations, optimal design, good supervision, avoidance of less attractive alterations, proper decisions, good relations with the contractor.(Pszenicki, 1980).

Is the client aware that changes in design cause difficulties in construction. Is he informed about the additional cost of making decisions that alter the design of the project.

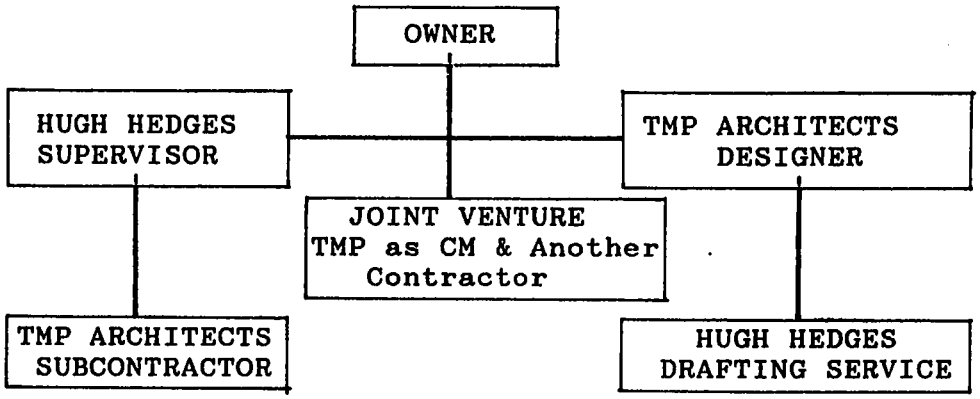
As projects increase in size and complexity. the need arise for different approaches to the contractual relationships between owner, A/E, and contractor. There has been a shift in the scope of services needed for the new arrangements. During the early eighties, there has been a trend for A/E firms in USA to shift or to add professional CM to their menu of services. William G. Krizan indicated that owners are currently preferring to package design and CM services. This is because they need to get things done quickly in the face of

increased construction claims as conflicts derive demand for management services.

Richard Korman documented a case in ENR, 1988 where a potential conflict of interest due to A/E dual role in a project of 3-storey apartment building in Bridgeport which collapsed killing 28 workers. The conflict of interest arise from the fact that TMP International, and TMP Architects which is headed by one manager signed a contract with Hugh Hedges to act as a supervision Architect who in return subcontracted part of the contract back to TPM as per Figure 2.1.

Michael Lawson and Debra K. Rubin ENR, 1988 indicated the trend now in industrial construction in USA is to cut in-house engineering staff while setting up permanent relationships with outside engineers. The authors states that such "corporate partnership" proved to be mutually benifetial. Owners with such relationships with engineering and construction firms feel more secure.

Figure 2.1: A/E Conflict of Interest OWNER



The construction process is generally characterized as linear consisting of six major stages; definition, planning, design, bidding or procurement, construction, and start up. It is a well established fact that the magnitude of influence on project attributes is greater in the earlier stages of the project. Therefore the client must exercise great care in making his basic decisions during the initial briefing period. The A/E is responsible to ensure that the client understands the need for keeping his basic decisions unchanged during the progressive stages of the project.

The client is responsible for setting his budget and determining the cost, quality, time mix.... The A/E is responsible for achieving these goals. The A/E is to consider the owner expectations that stem from his needs. Owner involvement is essential to set up his requirements of the function, and his expectations regarding the sitting, appearance and facility integration. He likes to see his directions and guidance shaping his design. At this stage the experience and competence of the A/E should reflect the above desires and expectations while not violating the viable technical and economical consequences of the decisions taken by the owner on materials and systems. He should exert every attempt to

explain to the owner these implications and be firm at certain time not to allow mistakes and deficiencies to take place as a professional (Jones, 1988).

The A/E interests should not prevent him from delivering the right message to the client. The A/E interests are:

* Compliance with the interests of the owner
* Regulatory authorities, & consultancy industry.
* Technical Compliance by design and reviews.
* Contractual compliance.
* Compliance with program execution schedule.
* Compliance to acceptable standards.

The A/E is interested in making good relations with owner, making profits and providing the quality of the project which lead to good evaluation, and possibly further selections for further work.

2.2 The A/E Client Relation in Saudi Arabia

The literature regarding the A/E practices in the Kingdom is limited. One study addressing A/E practices in the Eastern Province revealed that in most cases, the agreement between the A/E and the owner is oral on lump sum basis. The relationship relies heavily on mutual trust in the absence of any regulatory rules to draw the line between what is ethical

conduct of the profession and exact responsibility and authority of each party. This situation lead to various problems in the professional relationship between A/E and clients such as duplicating other A/E work, and the multiple use of the same documents for many projects. Other issues remain loosely defined and subject to controverting opinion. These issues include liability, contract provisions and fee (Shash, Alghanam, 1990).

Another study (Assaf 1989) addressing the A/E professional relationship with the private owner for small scale projects in the eastern province. The possible interface problems were investigated. The following is a documentation of these problems listed on the bases of there significance as was revealed by the study:

1) Owner unawareness of municipality requirements.
2) Slowness of owner decision making in accepting the final design.
3) Owners low budget for design services relative to his requirements.
4) Owner low budget for construction relative to his requirement.
5) Inaccurate estimate by the designer.
6) Lack of accuracy in drawings and specs.
7) Owner desire to modify the use of specs after design process is over.
8) Designer inefficient use of space.
9) Mistakes in writing the owner A/E agreement.

10) Insufficient communication design aids between A/E and Owner.

11) Lack of communication between A/E and client family.

12) A/E lack of experience.

13) High cost of design services.

14) Owner unawareness of the environmental factors to be considered by A/E.

15) Inappropriate selection of construction materials by the designer.

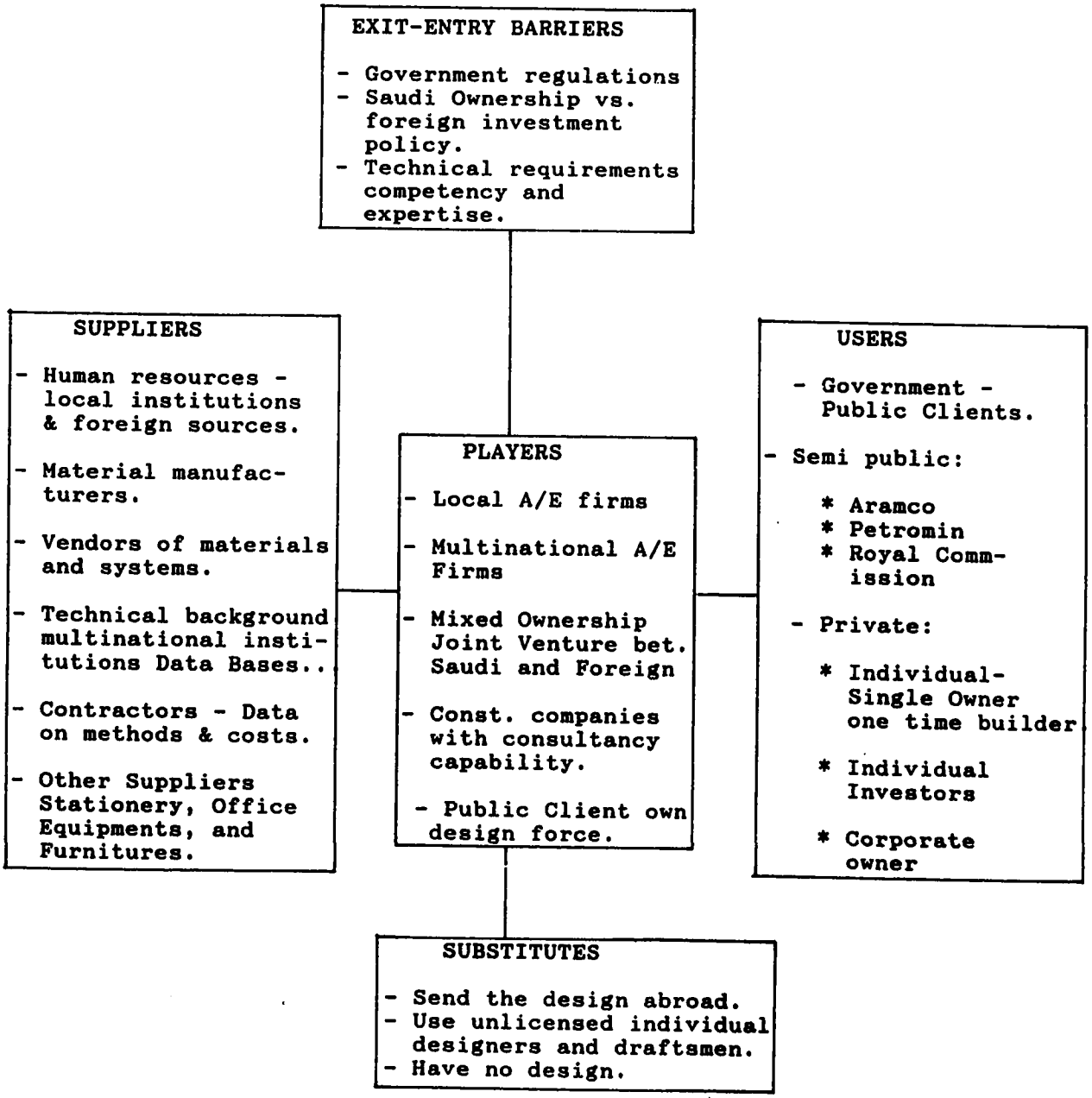
2.3 The Saudi Consultancy Industry

2.3.1 General

In the Kingdom, the engineering consultancy is composed of foreign and local firms operating at various levels of size and specialty. A summarized analysis for the local industry is presented in Figure 2.2. The total number of A/E firms registered in the Ministry of Commerce end of 1989 is 255 firms (Ministry of Finance, The Statistical Year Book 1989). Out of which, 34 are foreign firms and 21 are Saudi-Foreign. The small number of foreign firms doesn't convey its market share. In general, the foreign firms are huge multinational A/E firms capable of undertaking big projects. They are very well organized and have a long term orientation.

Figure 2.2 examines the various forces and components acting on the local consultancy industry.

Figure 2.2: Local Architectural Engineering Industry Analysis:



The state of competition in the local industry is intense, especially amongst A/E offices handling projects to a private owner - one time builder. Such competition led to lowering design fee substantially. A private sector owner, pays on average a fee around five thousand SR. for a project of 500 sq. meters. With such fee, the project is mostly underdesigned. It contains no specifications. No technical performance standard can be met with such arrangements. Consequently, the likelihood of defective project and failure is increased.

Engineering News Record (Jan. 5, 1989) documented a case where the A/E fee was substantially below the industry average. The result was a major collapse in the project resulting in injuries and losses.

For some other A/E firms, the above type of projects are not undertaken. When the A/E is involved in residential and small scale commercial projects, the requirements are more strict and detailed. The A/E provides the owner with a detailed design specifications and a Bill of quantities. In return the owners are to be ready to pay a reasonable fee for such service. Such arrangements have the potential to produce better design that can lead to a successful project.

For an other group of A/E offices, their involvement is mainly on public, semi-public and corporate owners. The

offices standards and engineering conduct is at high level of competency and professionalism. Such A/E firms engage with big projects and have the ability to fulfill the owner requirements at an international level.

For big and specialized projects, some local A/E firms bids on it in a joint venture basis with a multinational firm. This arrangement allows the local A/E to compete without holding big capital in terms of human resources. It gives him the opportunity to submit bids in a relatively short period of time utilizing the automated production means and techniques used by the multinational A/E.

Regarding marketing activities of local A/E firms to attract new projects, the techniques are still below the required level. The majority of A/E's rely on word of mouth in their promotion. Some advertise by means of brochures and leaflets. Others engage in public presentations in universities and government exhibition. There are few firms that conduct marketing on planned basis.

The case of one multinational A/E was investigated - Flour Arabian. The company has a division responsible to handle the marketing function. The techniques used are very elaborate. Within the Middle East locality, projects at the planning stages are detected. Information is gathered about each project. the marketing department decides on the most

suitable project types to be targeted closely. Contacts are made in early stages. the A/E firm gears attention to bid on these projects based on the data acquired about the project in advance. The result is a high percentage of timely new projects' involvement.

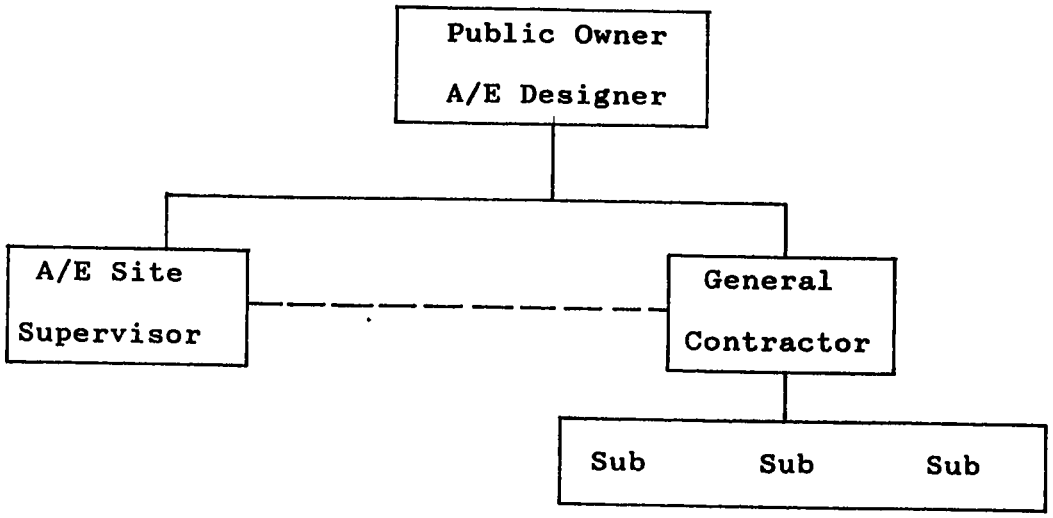
The substitutes of the local A/E consultancy services are limited. Consequently, the local A/E firms have the chance to compete in the majority of local projects. The more the local A/Es are involved in big projects, the greater the chance they build the needed technical base for development. This can increase the local A/E firms share of the market, and consequently increasing the multiplier effect into the economy and technology transfer as well.

2.3.2 Project Delivery Systems

There are two basic types of projects prevailing in the Kingdom, the public projects and the private projects. The public projects are built by the government. They follow a preset procedure and observe the government procurement regulations. They follow mostly the traditional approach utilizing a lump sum bid. the private projects are executed either by institutions such as Aramco, Petromin and local businesses, or by individuals. The two types follow different approaches in design and construction.

In this section, the public project delivery system will be emphasized. The general contracting delivery system is mostly used in public projects. The following figure 2.3 shows the delivery approach:

Figure 2.3: Project Delivery Approach



The project need and feasibility are decided by the public organization represented by a technical department "Engineering or Projects". According to the project preliminary estimate, budget is allocated. The public owner then engages with an A/E firm to prepare the project design. The scope of design services vary according to the need and any other requirements decided by the public owner. After the design is approved, a set of construction drawings specifications, and a

Bill of quantities are prepared. The intention here is to define the project to the finest detail in terms of quality and quantity as the contractors are supposed to bid on lump sum basis.

The project is then publicly announced to contractors to submit their offers. The public owner defines the contractors eligible for bidding. They are required to confirm to certain conditions and requirements -Contractors pre-qualification. The Contractor is required to submit a lump sum figure for the project where he is considered as a seller and the public owner as the buyer. The government procurement law requires at least three offers in the competition. In order for the bidder to bid on lump sum basis, the project needs to be described in details in the plans and specifications, together with the Bill of quantities. The public owner with his A/E firm will evaluate the bids and award the contract to the lowest responsible bidder.

This approach segments between design and construction. Therefore, doesn't have the opportunity to benefit from contractor expertise in the design stage. It has other problems relating to the difficulty to estimate cost accurately, and in having change orders. Nevertheless, it has the major advantage for the owner by controlling project cost (Mansouri, 1987).

As the general contracting - lump sum approach is the predominant delivery system used, there are other forms of project delivery systems used by public owners such as the professional construction management approach.

The Construction Manager acts as an agent for the owner participating in the project from the inception to completion. He delivers time, cost and quality to the Owner (Adrian, 1981). this form is used by some public clients in the Kingdom such as Ministry of Defense and aviation (MODA).

The turn-key form of project delivery is also used narrowly in specialized occasions. The public organization can resort to a separate consultant to control cost for this type of arrangement.

2.3.3 The Public Clients and Multinational A/Es

By tracing the profile of Saudi Construction Industry, one can confidently say that the real start was in 1973, with the first 5-year development plan (Mansouri, 1987). The government revenues jumped from US$ 531 million in 1960 to US$ 7.9 Billion in 1973, then to $107.8 Billion in 1982. During the decade of the seventies, the major user of the construction industry was the government.

Almost all of the country modern infrastructure huge scale mega-projects were going on. The consultancy industry serving such booming growth was mainly composed of foreign multinational A/E firms. The local consultancy was mainly involved in small scale projects for individual owner and private sector entities, where the demand on local services was great.

The year of 1983 is considered the end of the construction boom. Consequently, the consultancy industry was affected. Gradually, by the completion of huge projects multinational A/E firms started to clear the ground for local firms. During the eighties there was a great increase in the number of local A/E firms. However, their size was not increasing by the same rate. This situation resulted in few large firms and a majority of small offices. The large firms started to acquire expertise and technology to participate in big projects. The gab between local and multinational firms remains, but nevertheless is smaller as compared to the seventies. Time and hard work is needed for local consultancy industry to prove itself, build a solid technical base, regulate it is practice, and draws long term global strategies rather than local ones.

The Kingdom's infrastructure was laid down through mega-projects executed throughout the two five-year development plans in the period between 1970 - 1980. The projects included

road net works, communication, industrial cities, power generation, desalination plants, etc. During this period almost all projects were financed and sponsored by the government. The scale of the projects undertaken were so great and required high tech. expertise both in design and construction. Local A/E and contracting firms, as well as the institutions responsible for the projects lack in-house engineering capabilities.

Consequently, the government relied on multinational consulting firms for effective management. This situation was gradually changing as the government realizes the importance of local participation to gain the needed experience for technology transfer and to increase the multiplier effect in the local economy by employing the growing local engineering and contracting firms.

This shift can be seen in the third and fourth 5 year development plans (1980 - 1990). As governmental clients started to possess system engineering competence, mega-projects were split into smaller ones, that can be handled by local A/E and contracting firms. The public client then exercised overall management of the sub-projects. Even then, the public client may retain the services of one or more big multinational A/E firms to assist in overall control and management (Zahlan, 1989).

As public clients gained their technical competence, there were less need for the multinational firms to assume the clients role in defining the need of the project developing the brief, and carrying out the rest of design responsibilities. This of course puts the multinational A/E firms into a considerable conflict of interest (Zahlan, 1989):

"This situation seems to prevail in many developing countries. A conference held in Manila and organized by the International Federation of Consulting Engineers (FIDIC), the attitude of the third world was expressed by Alfredo Juinio, Philippines Mister of Public Works, as follows:

- There often seem to be differences between the client's perception of his needs and the consultant's assessment of the same needs.

- The Client in the developing country, whatever his aspirations and his expectations, often lacks sufficient technical ability to evaluate the consultant's views. In consequence, it becomes one of the important responsibilities of the consultant to ensure that the most suitable options are found and that the alternative selected is the most appropriate to meet such aspirations and expectations.

- The reliance of the client on the integrity and the ability of the consultant must be presumed. That is clear. The consultant, for his part, must fully recognize and accept this responsibility without reservations.

- We want to ensure, too, that what's designed and built is appropriate. To the culture of the economy of the country and in line with the national plan.

By this, again the clients responsibility has been transferred to the multinational A/E. It seems that such transfer can not be resolved by relying on the multinational A/E integrity and ability. The issue is that the multinational A/E is fundamentally incapable of assuming the client's responsibility.

Communication is another problem arising from the transfer of responsibility as was noted by Miller (FIDIC Executive Committee). The problem lies in defining the client's needs and establishing the brief. This is due to the fact that the multinational A/E dealt with decision maker/politicians operating at a broad level of authority. This approach is prevalent in Saudi Arabia as part of the Arab and developing countries."

2.3.4 A Guideline For The Use of Consultants:

Each public institution eligible for a share in the governmental budget for projects has an engineering department handling all tasks related to construction and maintenance of projects and facilities. Engineering services can be provided either by in-house staff or by contract with Consulting Engineers. The following are some tips on future consultants (Erling A. Tufti 1989):

- When there is a lack of in-house power.
- For their specialized technical expertise.
- To solve as a neutral party.
- When required by political or legal constraints.
- For non repetitive work.
- For computerized application.
- For large complex projects.

Regarding consultant's recruitment and selection the first step is to identify scope of work and skills needed, then requesting for proposals. The following are some key

items in evaluating proposals for engineering services (Erling A. Tufti 1989):

- experience and references , familiarity with project requirements, work program including schedule, clarity of proposal, attitude, adequacy of project performance, equipment and, facility, compensation, creativity, responsibility, communication, professional qualifications, and client expectation.

Moreover, the following are some techniques to help clients in managing consultants effectively:

1. The presence of competition.
2. Encourage a strong personal relationship and understanding between the consultant and governmental agency.
3. Strongly enforce the condition stated in the contract or agreement for consulting services.
4. Progress Reports.
5 The inclusion of incentives or penalties.
6. Expectations consultant has of a governmental agency in terms of:

- Payment for services performed
- Communication and Cooperation
- Confidence and future consideration
- Firm, timely decisions and recognition
- Designation of agency contact.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 General

Basically, this research is composed of two parts. The first part is a documentation of the current construction engineering consultancy practices as documented in the literature, and observed in the practice. The second part is an examination of the public owners interface with local A/E firms based on data collected directly from the industry by means of questionnaires addressing the A/E firms and the public owners.

3.2 Required Data

The data used in the research was obtained from three major sources; The literature locally and internationally, The local A/E population, and The Public owners employing local A/E services.

3.2.1 Data Obtained From The Literature

The search for data includes; the A/E client professional relation, the A/E duties and liabilities, present trends in the consultancy practices, Local A/E practices and interface issues with the clients relevant to the Saudi environment, the Saudi consultancy industry analysis, the public clients and multinational A/Es interface in Saudi Arabia, and a guideline for the use of consultants by public owners.

3.2.2 Data Obtained From local A/E offices

It was intended to reach the majority of local A/E firms to acquire an industry representative data. The data obtained from local A/E offices include the following issues:

* The profile of the projects undertaken by local A/E firms. The intention is to determine the office involvement, as the research is limited to building projects.

* The profile of the services offered by the local A/Es measured on a five point scale based on the frequency of occurrence.

* The clients served most by local A/Es measured by the frequency of business engagement with each type.

* The methods in which local A/Es acquire new projects, and get compensated by their clients.

* The local A/E perception and evaluation of his client in terms of their appreciation of the A/E roll, participation in the design process, cooperation, and willingness to pay a reasonable fee to get a fairly detailed design package.

* The extent in which clients demand services that can't be provided by local A/Es.

* Profile of the size and experience of the local A/Es. The size was measured by two variables; the number of employees serving in the A/E firm, and the average monetary value of the projects undertaken by the A/E within one year. The A/E experience was measured by the business life (years of practice in the kingdom for the firm). The educational levels of the A/E employees was inquired as well.

3.2.3 Data Obtained From Public Owners

The entire population was reached. The inquired data from public owners included the following:

* Types of building projects built by public owners, and the monetary value SR. for each type.

* The scope of services obtained from local A/Es ranging from basic design services to comprehensive services. The intention was to determine the services demanded most by public clients.

* The methods followed by public clients in selecting and compensating local A/Es.

* On a five points scale, the public owners' response regarding their appreciation and participation in the design process, and their satisfaction level with the services obtained from local A/Es in terms of the following attributes as it relates to their evaluation of the design part of their projects:

1. Functional performance and need fulfillment.
2. Cost effectiveness of the design.
3. Aesthetic performance of the design.
4. Buildability of the design.

The public owner satisfaction was measured indirectly by their response to the A/E experience, ability to finish the project on time, and the degree of change orders originating from design deficiency. This - indirect - measure intends to verify public owners response, and to arrive at a reliable measure of their satisfaction with the A/E services.

3.3 Data Collection

The required data from the two groups; the local A/E offices, and the public owners were put in two questionnaire formats addressing both populations. The questionnaires were designed to suit the data collection mode and were supplemented with a list of definitions for the key terms used. Samples of the two questionnaires are provided in appendix I. The questionnaires were mailed to both populations to give them a unified collection mode.

For the local A/E firms the key informant was requested to be the principle of the A/E firm or the chief designer. Similarly, the key informant for the public owners was requested to be the project department head.

In accordance with the research plan, the public client population was reached by mail. The first and second contacts yielded little response. Further follow up was made personally and by phone. The total number of participants is 24 public agency representing 2/3 of the population. The remaining were categorized as non-response. Some public organizations who used to enjoy high share of government projects budget have completed most of their construction. Therefore, they have almost no building projects at the present time. Some other organizations have full scale in-house engineering capabilities and declared that they don't employ any A/E firms.

Similarly, the 120 A/E firms were reached by mail. The response rate was considerably low - possibly due to the January, 1990 Gulf War. The second contact was made by mail to the entire population. Then the third contact to those who didn't respond was made by FAX. A total of 40 A/E firms responded to the questionnaire which represents 1/3 of the population. The remaining are classified as non-response.

3.4 Respondents Selection

In the Kingdom the clients' served by local A/E firms are public, semi-public, and private. The study is limited to public clients . Therefore, the entire population was reached. All public clients who are eligible for a share in the government projects budget have engineering departments within their structures.

According to the ministry of finance latest issue, (Ministry of Finance, The Statistical Year Book, 1989) there are 27 public organization with fund allocations for projects. Their names are presented in Appendix III. Three organizations have branches in four major cities other than Riyadh. This brings the total of public owners to be 39 organizations.

The total number of engineering firms registered in the Ministry of Commerce end of 1989 was 225 firms (Ministry of

Finance, 1989). This figure includes all of the classifications and disciplines. According to the engineering committee latest issue (1411 H) the number of active engineering consultants A/E firms involved in building construction is 120 firms in the three cities of Dammam, Riyadh, and Jeddah.

There are local and foreign offices specializing in engineering disciplines other than building construction. They were not included in the population for this study. This is due to the fact that the research is limited to building projects as was stated in the research objectives.

3.5 Data Analysis

The collected data from both populations; the A/E firms and the public clients was coded and entered into a main frame computer utilizing the package of Statistical Analysis Systems SAS. Due to the nature of the collected data being non categorical, the statistical tests applicable were limited. Never the less, the statistical analysis should always be viewed as a tool. In this sense it will be used to the degree it satisfies the research objectives. Therefore, the analysis relied heavily on indexes computation, and the very powerful feature of SAS, namely the cross-tabulation.

CHAPTER FOUR

RESULTS AND ANALYSIS

4.1 General

The data obtained from the two populations; the local A/Es and the public owners was analyzed utilizing the SAS package. The analysis relied on indexes in measuring the various attributes of the data. This is due to the nature of the data - non categorical. The analysis of the two questionnaires were combined to facilitate comparison. The actual response to the two population is provided at the same questionnaire formats in appendix I. The response is expressed in percentages based on the participants response to each question.

4.2 Consultants Characteristics:

Almost all of the A/E firms participated in the survey are Saudi owned. Their characteristics are expressed in terms of size, type of services offered, type of projects undertaken, experience, and the clients they serve. The following

sections deal with each of these characteristics as revealed by the respondents.

4.2.1 A/E Office Size:

The A/E office size was measured by two attributes; the number of it's employees, and the average monetary SR. value of the projects undertaken by the A/E within one year. The survey revealed that the average size of the local A/E firm is 91 employees. The size ranges from 6 to 650 employees, which indicates a great variation. The coefficient of variation (CV) is 152.

Furthermore, the average project monetary value is 172 million SR, ranging from one million SR to over one billion SR. The (CV) is 182. This suggests a degree of consistency between the two measures in determining the office size. This was confirmed by the result of cross tabulation between the two variables. It suggests that the greater the number of employees in the A/E firm, the greater the likelihood of being involved in larger projects. Table 4.1 and 4.2 present the A/E size as determined by the two measures. It can be noticed that the intervals are not equal in table 4.1. This is due to the nature of data regarding this issue. Figures 4.1 and 4.2 provide a visual picture for this issue.

Table 4.1: Offices Size by Project Value

Project Value (millions of SR.)	Mean %
Up to 10	46
Above 10 - 100	23
Above 100 - 500	19
More than 1 billion	12

Table 4.2: A/E Office Size By No. of Staff

No. of Employees	%
Up to 10	46
Above 10 - 20	0
Above 20 - 30	0
Above 30 - 40	4
Above 40 - 50	8
Above 50 - 60	4
Above 60	38

Figure 4.1

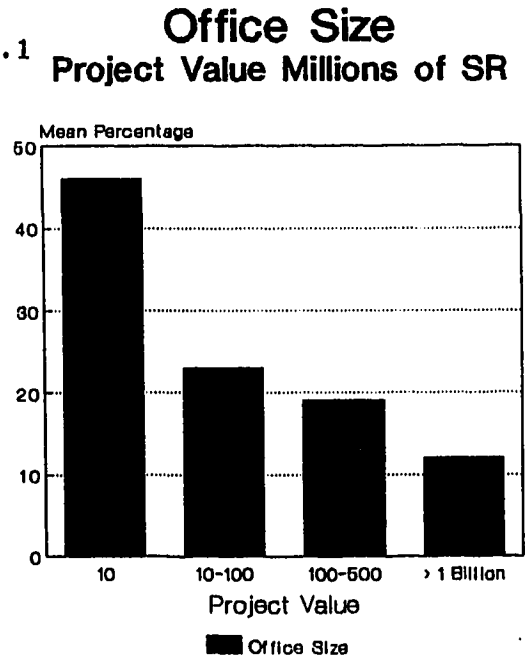
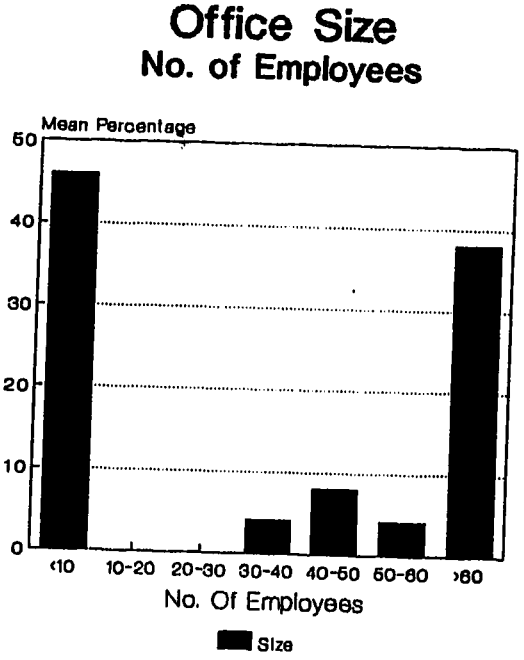


Figure 4.2



4.2.2 A/E Offices' Experience:

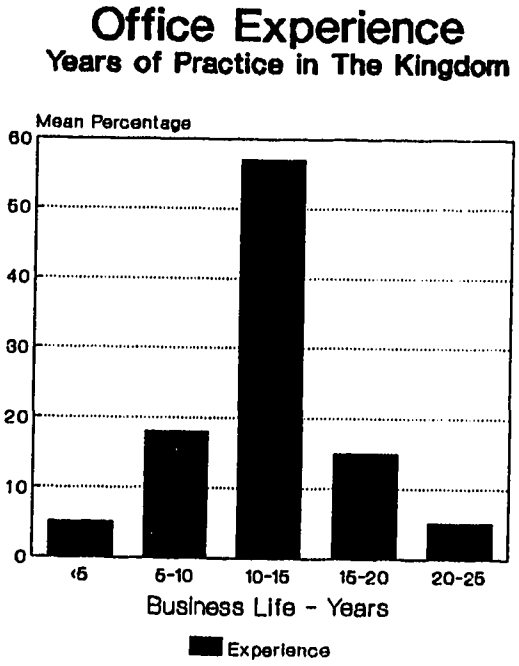
The A/E experience is measured by the Business Life expressed in the number of years of practice in the Kingdom. The survey showed that the average years of experience - practice - in the Kingdom is 13 years. The range is from (1-25) years. It is evident that the consultancy industry is a young and developing industry as compared to the matured industries in the west where engineering consultancy has been practiced for more than one century. The coefficient of variation (CV) in business lives amongst A/E firms is 36 which is relatively low. It suggests that the distribution of A/E business lives is close to the mean which implies that the majority of A/Es entered the market in the early eighties. Table 4.3 as well as

figure 4.3 present the A/Es business life as expressed in the years of practice in the kingdom.

Table 4.3: A/E Years of Practice In The Kingdom

Business Life # Years of Practice	Mean Percent %
Up to 5	5
Above 5 to 10	18
Above 10 to 15	57
Above 15 to 20	15
Above 20 to 25	5

Figure 4.3



The A/E expressed the educational level of their employees as follows; 50% of the A/E population have employees with Ph. D. qualification. Another 66% of the A/Es have employees with Master's Degree. All of them have employees with Bachelor Degrees and Diplomas.

4.2.3 Types of Projects Undertaken by A/Es

The A/Es were asked to rate the frequency of their involvement for each project type on a 5 point scale ranging from 4 to 0 as follows: Always representing 4, Mostly representing 3, Sometimes representing 2, Seldom representing 1, and Never representing 0. An involvement index of all A/E firms for each project type was developed by multiplying the scale point by its percentage frequency of response and summing up the results. The involvement index can range from 0 to 100. All indexes used in this research were unified so that the ideal index is 100 to facilitate comparison. The following example illustrates the index calculation:

Example: In appendix I the A/Es response regarding the type of projects undertaken by them was:

1. The Projects your office undertake are:

	ALWAYS	MOSTLY	SOMETIMES	SELDOM	NEVER
Civil projects	[11]	[17]	[43]	[20]	[9]

Index = (11*4 + 17*3 + 43*2 + 20*1 + 9*0) / 4

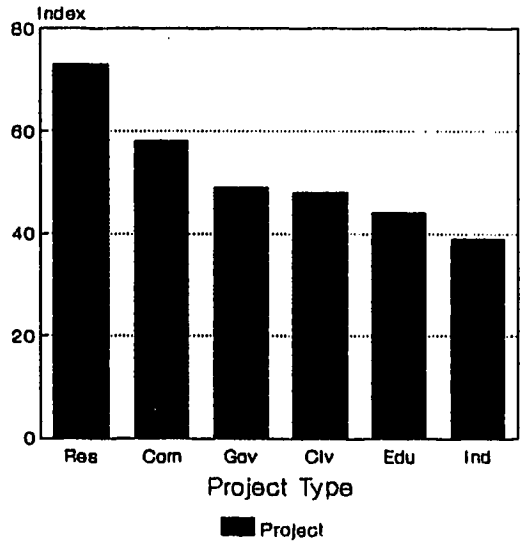
= 48

Table 4.4 and figure 4.4 present each project type with its index representing the A/Es involvement:

Table 4.4: Type of Project Undertaken By A/Es

Project Type	Index
Residential	73
Commercial	58
Governmental	49
Civil	48
Educational	44
Industrial	39

Figure 4.4 Type of Projects Undertaken by A/Es



It is evident that residential and commercial projects represent the majority of local A/E involvement. Civil and governmental projects come next. Industrial type of projects represent the lowest level of involvement. The survey reflects the trends at the present time. The share of civil and industrial projects was huge in the seventies and early eighties where the country infrastructure was built. Most of the projects were handled by multinational A/Es (Mansouri, 1989). The local A/Es were not in a position to compete hard on them. The local A/Es should expand quantitatively and qualitatively to get into high-tech projects. To achieve this, it is mandatory to integrate the local market with the Arab Countries to maintain an adequate level of supply for local A/E firms. Otherwise, the above statistic regarding local A/E involvement shall continue.

The low level of local A/E participation in educational facilities is explained by the fact that the ministry of education engineering department performs the design function. This was declared by the Ministry of Education engineering department. Furthermore, the ministry of higher education represented by some of the universities employed multinational A/E firms for their major projects.

The public owners were asked to indicate the types of projects they build. No scale was used to measure the frequency of occurrence as was used for the A/Es. Therefore,

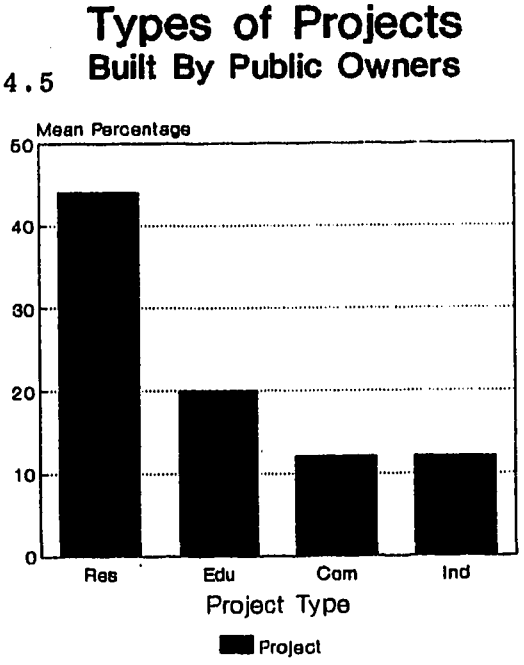
the response was expressed in terms of frequency percentage. Table and figure 4.5 indicates the break down of the governmental projects.

Table 4.5: Public Projects Type

(% refers to the frequency of response)

building Type	Frequency %
- Residential Bldgs.	44
- Commercial Bldgs.	12
- Industrial Buildings	12
- Educational Buildings	20

Figure 4.5



The public owners build residential buildings more frequently than any other building type. However, the magnitude of building type can be determined better by size or total monetary value. The majority of respondents to the

questionnaire indicated the frequency and ignored the SR. value for each type.

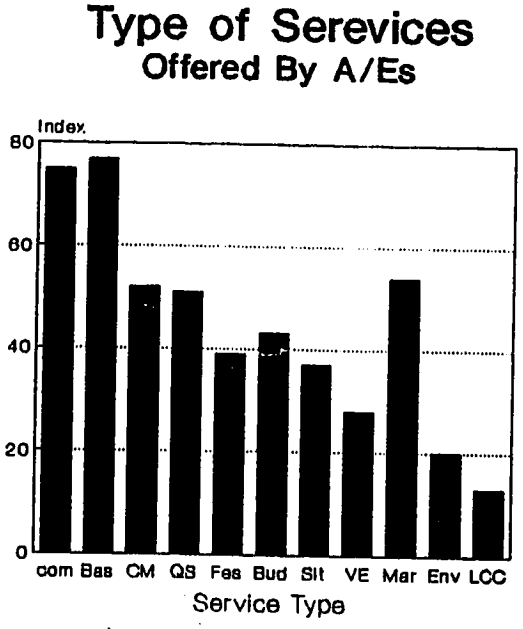
4.2.4 Type of services offered by A/Es

The frequency of A/E response regarding the type of services they offer was computed in index format in a similar way as indicated in section 4.2.3. Table and figure 4.6 present the A/E response.

Table 4.6: Services Offered by Local Consultants

Type of Service	Index
Comprehensive Services	75
Basic design services	77
Construction Management	52
Quantity Survey	51
Feasibility	39
Budgeting	43
Site Selection & Analysis	37
Valve Engineering	28
Marketing Studies	54
Environmental Studies	20
Life Cycle Costing	13

Figure 4.6



The major type of service offered by local A/E firm is basic design. The A/E role starts at the design phase. The service involves - at most - producing a set of working documents. This service is predominant for private projects especially those owned by single owner one time builder. For corporate owners and government, an expanded A/E role in the design is more likely to take place. The service includes - beside the detailed set of construction documents - specifications, and other services based on the clients request, such as site supervision.

The A/Es indicated that 75% of the time they are involved in comprehensive services. Such services include; planning, feasibility, pre-design, design and supervision. This issue was examined further by means of control questions to verify response. It is evident that actually about 50% of

the A/E firms are involved in the services that constitute the comprehensive service such as feasibility, site analysis, and environmental studies. This situation can be explained by the possibility that the A/E firms consider a comprehensive service as their involvement in design -drawings and specs -and supervision. This situation exists in spite of the fact that the term comprehensive service was defined in the questionnaire.

Regarding the services offered in the design stage, the survey showed that 28% and 51% of the firms are involved in value engineering and quantity survey respectively. Only 13% perform any life cycle costing studies, environmental studies or marketing studies. The last 3-services are implied in the agency construction management service where 52% of A/E firms claimed they are involved with. Again post-survey inquiries revealed that supervising and managing construction on behalf of the owner is considered as project management service. Again the term was specifically defined to respondents in the questionnaire.

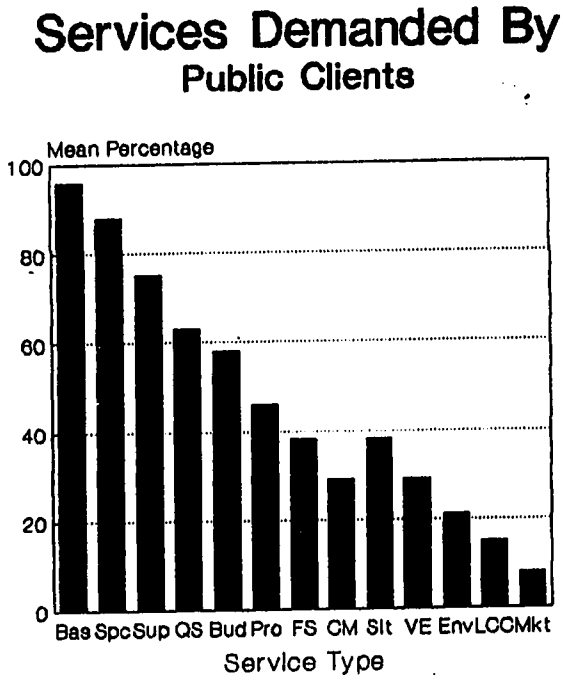
4.2.5 Type of Services Demanded By Public Owners

Public owners survey revealed that they employ the local A/E firms for the services presented in Table and figure 4.7.

Table 4.7: Services Demanded by Public Owners

Type of Services	Frequency %
- Basic design services	96
- Specifications	88
- Site Inspection	75
- Quantity Survey	63
- Project Budgeting	58
- Programming	46
- Feasibility Study	38
- Construction Management	29
- Site Selection and Analysis	38
- Value Engineering	29
- Environmental Studies	21
- Life Cycle Costing	15
- Marketing Studies	8

Figure 4.7



It is evident that the demand is greater on basic services, specifications, and site supervision. This is due to the nature of governmental projects and its regulatory policy. The majority of public projects are let via competitive bidding on lump sum basis. Consequently, the project must be described very well in terms of quantity and quality at the bidding stage. Site inspection is a mandatory requirement too. The 20% who indicated not using A/E either inspect their projects by their own forces or use the services of the ministry of public works engineering departments as the case of ministry of pilgrimage and endowment.

The demand is low in the areas of constriction management, value engineering, pre-design services, feasibility, site analysis, environmental studies, programming, marketing and life cycle cost analysis. This is due to the non-profit orientation of the public projects and the fact that the engineering departments in some public agencies are performing the A/E role in this regard. Nevertheless, there is a need for a full scale assessment of the in-house capability and experience to carry out all of these services. The public owners need to draw enough attention towards long term implications of under estimating the need for these services especially, CM and VE services.

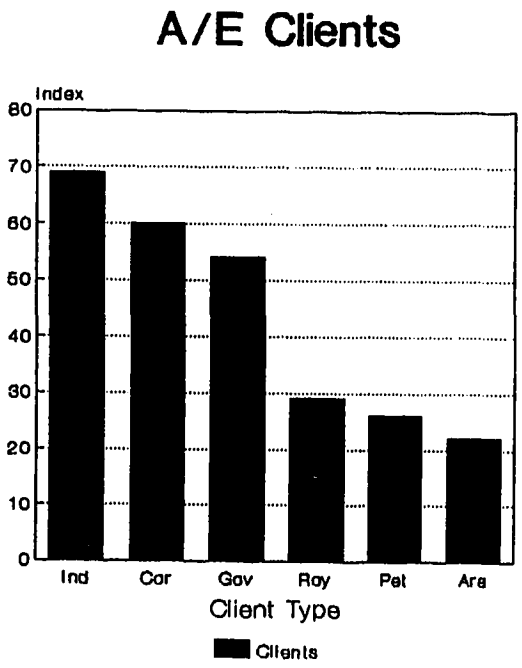
4.2.6 A/E Clients:

The A/E clients were measured by the frequency of their business engagements with local A/E firms. Similarly an index was developed for each client category. Table and figure 4.8 present the various clients.

Table 4.8 A/E Clients:

Client Type	Index
Private-Corporate	60
Private-Individual	68
Government	54
Royal Commission	29
Petromine	26
Aramco	22

Figure 4.8



The survey revealed that the private owners - corporate and individual are the most frequent users of A/E services. Public owners come next. The number of private projects is greater than public projects. For this reason it seems that the A/Es are involved more with private owners. If the involvement is compared on the basis of project size - SR. value -the public projects shall prevail. This is evident by the fact that public share in construction expenditure is greater than the private. Also, the average project size undertaken by A/E for all client categories is 172 million SR. While the average public project size alone undertaken by the local A/E is 400 million SR. The mean value of project size was decreased due to the inclusion of private projects.

The low shares of the other clients such as Petromin and Aramco are due to their localities where their operation is concentrated in the eastern region. Royal Commission still relies on multinational A/E firms for its large scale high-tech. projects.

4.2.7 A/E Selection:

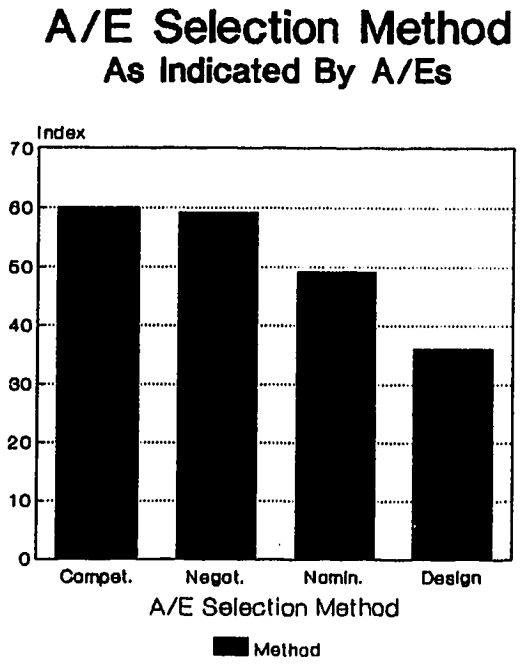
This issue was asked to the two populations. The A/Es indicated their selection method as shown in table and figure 4.9 as follows:

Table 4.9: A/E Selection Method:

(As indicated by the A/Es)

A/E Selection Method	Index
Competitive Bidding	60
Direct Negotiation	59
Nomination	49
Design Competition	36

Figure 4.9



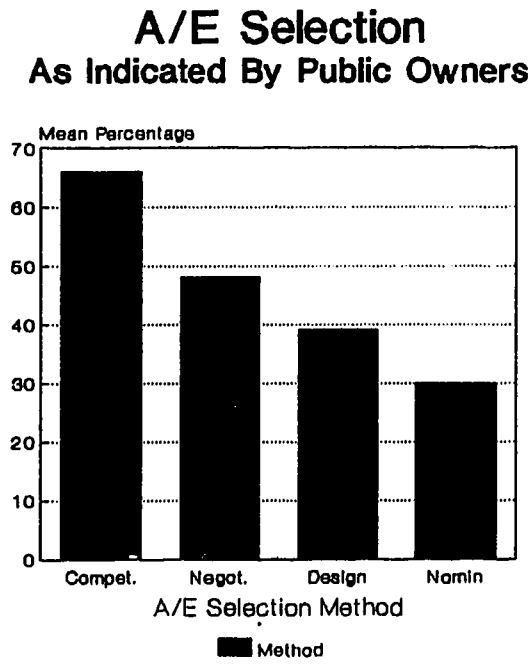
Similarly the public owners indicated their methods of A/E selection as presented in Table and figure 4.10:

Table 4.10: A/E Selection Method:

(As indicated by public clients)

A/E Selection Method	Frequency %
- Competitive Bidding	66
- Direct Negotiation	48
- Design Competition	39
- Nomination	30

Figure 4.10



The majority of A/E firms are awarded design contracts by competitive bidding. Direct negotiation comes next. The least used methods are design competition and nomination. It can be noticed that A/E response to the least two methods is

reversed as compared to the public owners. This might be attributed to fact that the A/Es response stands for public as well as private clients. However, the overall response from the two populations is close.

4.2.8 A/E Compensation

Tables and figures 4.11 and 4.12 present the A/Es compensation methods as indicated by the A/Es and the public owners respectively:

Table 4.11: A/E Compensation Method:
(As indicated by the A/Es)

Compensation Method	Index
Fixed Fee	78
Hourly rate	39
% of Cost	24

Table 4.12 A/E compensation Method:
(As indicated by public owners)

A/E Compensation Method	Index
- Fixed Fee	77
- % of project cost	23
- Hourly Rate	14

Figure 4.11 A/E Compensation Method
As Indicated By A/Es

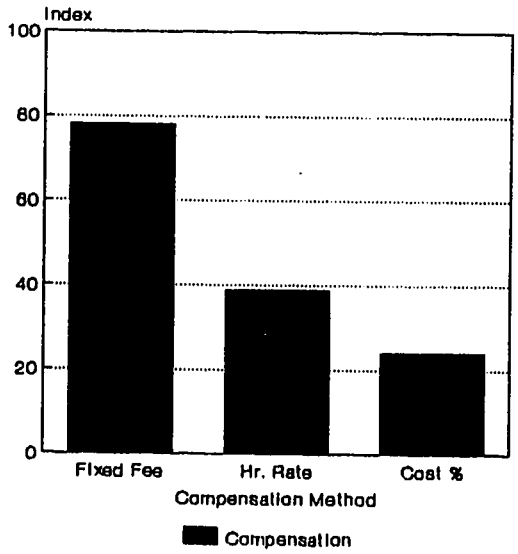
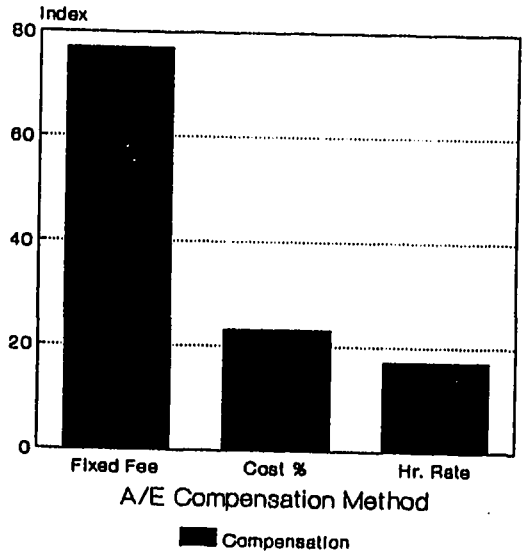


Figure 4.12 A/E Compensation Method
By Public Owners



The A/Es and the public owners use the fixed fee dominantly for compensation. This method is dominant for public and private projects. A/Es indicated more use of the hourly rate method as compared to the public owners. The hourly rate and the % of project cost are the least used by public owners. This goes in accordance with the government procurement law. For some exceptional cases when the project size is too small or requires extra-ordinary skills and expertise, the above predominant methods are deviated.

The amount of compensation relies greatly on the scope and degree of detail of the services. The general rule of thumb, for a well designed projects is to have a fee about 10% of total project cost (Jones, 1988). In projects designed for individual owners - one time builders- the A/E fee can get considerably low (0.2 % of project cost). The result is an inadequately designed projects which most likely end up costing the individuals and society more. The owners are urged to realize the return on their investment in the design phase. A bad design can never result in a successful project.

4.3 Interface Between Local A/Es & All Clients

The owner and the A/E are the two participants in the building process up to the stage when the contractor is chosen. The decisions taken in the planning, programming and

early design stages bear great influences on the total outcome of the project in terms of quality, cost, and completion time.

The survey which was addressed to the local A/Es collected data on the A/E owner relation from the A/E point of view. The A/Es expressed their views about their clients of all categories in terms of their appreciation of the A/E role, participation in the design process, and satisfaction with the design services. It is true that the A/Es views on their clients satisfaction can't be taken as a reliable measure for the clients satisfaction. The clients themselves are the best judge on this issue. The survey of public owners examines this issue in depth as well as other issues relating to the owners characteristics in section 4.5.

4.3.1. Clients Characteristics As Viewed By A/Es

In the local consultants survey, the A/Es expressed their opinion about the clients they serve regarding various issues. The frequency of their response is presented in the same questionnaire form in appendix I. An index for each response was calculated using the same method explained earlier. Table 4.13 present the clients characteristics as viewed by the A/Es.

Table 4.13: A/Es View of Their Clients

Owner Characteristics	Index
* Owner(s) approach A/E with well defined project requirements.	48
* Owner(s) demand pre-design services.	48
* Owner(s) review design thoroughly with the A/E.	64
* Owner(s) seek second professional opinion on the design before approval	33
* Owner(s) insist on A/E to keep design within budget.	62
* Owner(s) demand basic design services only.	49
* Owner(s) keep contact with A/E during construction even if A/E is not involved in supervision.	46
* Owner(s) are prepared to pay a reasonable fee to get accurate and detailed design.	33
* Owner(s) conduct constructability reviews on the design.	37
* Owner(s) overlook the significance of the design stage in	52
* Owners hold A/E responsible for design errors.	84
* Owner(s) respect and trust the professional advice of the A/E	61
* Owner(s) - in general - are satisfied with A/E services.	70
* Owner(s) demand additional services that can't be provided within the A/E office expertise.	40

The A/Es indicated that 48% of their clients approach them with well defined project requirements. From these requirements, the A/E develops the functional and architectural programs. Well defined requirements at the early design stage is considered of great importance in deciding the major features of the project and significantly contribute to the ultimate success of the project.

The A/Es indicated that 48% of the owners demand pre-design services. Pre-design services include feasibility, budgeting, site selection and analysis, and impact studies... . In the public owners survey they indicated that less than 40% of the time they are employing pre-design services.

The A/Es indicated that 64% of the owners review design thoroughly with the A/E. This suggests a high level of owner participation and communication as viewed by the A/Es.

The A/Es indicated that 33% of the owners seek second professional opinion on the design before approval. This second opinion can be through another A/E acting as a construction manager, or through a contractor to advice the owner on the buildability of the project. The percentage is considered to be low especially when compared to the previous response regarding owners reviews of the design which was 64%.

The A/Es reported that 62% of the owners insist on them to adhere to budget. This suggests that the budget limits are pre-set for the project and the A/E performs estimates of project cost to ensure remaining within the budget boundaries.

The A/Es indicated that 49% of owners demand basic design services only. This suggests that the other 51% of owners demand other services beyond basic design. However only 30% of the public owners actually reported that they've used pre-design, CM, and VE services.

The A/Es indicated that 46% of owners contact the A/E in construction stage even if A/E is not involved in site supervision. Such contacts intend to clarify, correct, or complete certain information.

The A/Es indicated that only 23% Of the owners are prepared to pay a reasonable fee to get accurate and detailed design. This issue reflects the owner appreciation of the A/E crucial role in achieving a successful project.

Private owners in particular need to be convinced about the feasibility of investing in the design part of their projects. Low fees can result on an under-designed project especially in the technical specifications and details which result in early deterioration. For public owners, the process of A/E compensation is well established.

The A/Es indicated that 37% of the owners conduct constructibility reviews on the design. The A/E response regarding this issue is consistent with the other percentage (33%) of the owners seeking second professional opinion on the design.

The A/Es indicated that 52% of the owners overlook the significance of the design stage in producing a good quality project. This response conveys the general perception of local A/E firms towards their clients. The other responses of the A/E firms reported that 64% of the owners review the design thoroughly, 48% approach the A/E with well defined project requirements. Furthermore, 61% respect the professional advise of the A/E. It is most likely that the A/Es have referred to the issue of compensation as only 40% or the owners are prepared to pay a reasonable fee to get a well detailed design project.

The A/Es indicated that 84% hold the A/E responsible in case of design errors. In the other survey, the public owners declared that 75% of the time the designers commit design errors resulting in change orders that can reach up to up to 20% of project cost.

The A/Es indicated that 61% of the owners respect and trust the professional advise provided to them by the A/E.

They indicated that 70% of their clients are satisfied in general with the A/E services. This response

reflects the A/Es point of view. Other measures directly and indirectly have been addressed to verify this claim in section 4.5.

* The A/Es indicated that 40% of the time owners demand additional services that can not be provided within the A/E office expertise. This response might apply only to a fraction of the A/E population. In the other survey 60% of public owners reported that the local A/E firms are capable of providing comprehensive services.

4.3.2 The A/E firms Heavily Serving Public Clients:

The above statistics relate to the total population served by the Local A/E firms which include private, semi-private and public clients. In the A/E survey, a class of A/Es indicated that they are frequently serving public clients. Their responses were screened to detect any variation in their characteristics and views on their clients as compared to the total population of local A/Es.

4.3.2.1 Variations In A/Es Characteristics:

The comparison was made by taking a class of the A/E population that are heavily involved with government projects

to examen their responses and compare it with the total population to detect any variation among the two classes. The following observations were made when comparing the two classes:

* Insignificant changes in the type of services offered by the two categories.

* The bigger the A/E office size the greater the likelihood of his involvement with the public clients.

* The A/E experience measured by business life bear little effect on their level of involvement with the public clients.

* The greater the project size, the less likely it is to be initiated by private clients.

* The more the A/E office is involved with public projects the greater the likelihood to have employees with Ph. D. and Master's Degree.

Regarding the clients' characteristics as viewed by local A/E firms, out of the A/E firms heavily serving public clients as compared to the total population of A/E firms the following observations were made when considering project type:

* Increase in the share of civil projects by 15% in industrial projects by 20%, in government projects by 20%, and in educational projects by 15%.

* Decrease in residential projects by 5% and in commercial projects by 10%. This suggests that there is a difference in project type undertaken by A/E firms serving public clients.

* The method of awarding design contracts to A/E firms remains unchanged when comparing the two classes except for minor variations. Competitive bidding, and design competition are used more frequently with the A/E group serving public clients. In the other hand, direct negotiation and nomination are less frequent. The method of compensating A/E firms by public client group is also changed slightly towards more use of percentage of cost and hourly rate methods.

4.3.2.2 Variations In Clients' characteristics

The clients as viewed by that class of A/E firms heavily serving public owners were characterized as follows:

* They indicated that 60% of the time they are approached with well defined project requirements. The differ-

ence in size and complexing between the public and private project bear an effect on this issue. The private projects in general are far less in monetary value. The requirements are much straight forward especially regarding the residential small scale single owner one time builder.

* The A/E class indicated that 70% of their clients demand pre-design services. The increase here is 22% which suggest that public owners either due to regulations or by being more experienced about the role of such services in producing a successful projects.

* The A/E class indicated that 50% of their clients seek second professional opinion in the design. The increase here is 18% as compared to the total group. This increase is considered with the response regarding constructibility issue. It shows the owner appreciation of the importance of such reviews in detecting errors early in the design stage. As the errors remain uncorrected further in the process, the consequences in cost and quality are greater.

* Furthermore the comparison of the two classes showed an increase in A/E owner post design communications for the A/E group heavily serving public client. This can be attributed to the fact that the professional relation is more formalized with public owners as compared to private owners. The public projects are greater in size and complexity.

Consequently, the need for contact after design is greater.

* There has been an increase in the willingness of clients to pay reasonable fee. This difference might have been generated by public owners.

* An increase is noticed in the A/E class serving public owners in terms of demanding additional services beyond the capacity of A/E firm. This might be linked to the willingness of public organizations to deal more with local A/E firms.

4.3.2.3 A/E Views on Their Clients

The A/Es opinion on their clients as expressed in table 4.13 can be summarized in three major characteristics measured - from the A/E point of view - by taking the mean index for certain attributes - questions - in the A/E survey as follows:

First: Clients appreciation of A/E role:

The mean index is 49. It was measured by the following issues:

1. Clients demand for pre-design services.
2. Clients insisting on budget boundaries.
3. Clients readiness to pay reasonable fee.

4. Clients realizing the significance of the design stage.

Second: Clients participation in the design process:

The mean index is 45. It was measured by the following issues:

1. Clarity of project requirements.
2. Review of the design thoroughly with the A/E.
3. Seeking second professional opinion on design.
4. Contact A/E in post design stage.
5. Conducting constructability reviews on design.

Third: Clients satisfaction of A/E services:

The mean index is 66. It was measured by the following issues:

1. Clients satisfaction with A/E services.
2. Clients respect and trust the professional advice of the A/E.

It can be noticed that the A/Es opinion on their clients regarding the above measures is not impressive. It must be based on first hand interaction with the clients. It reflects the total client population consisting of public and private clients. The above measures will be verified by examining the public clients response in the following section.

4.4 Interface of Local A/Es With Public Client

In the public owners survey, the owners were asked to respond to various issues regarding their professional relationship with local A/Es. The frequency of their response is presented in the public owners questionnaire form in Appendix I. An index for each response was calculated in table 4.14 as follows:

Table 4.14: Public Owner A/E Interface.

Public Owners Response	Index
* Owner(s) should employ A/E for basic design services only.	48
* Owners can get comprehensive services from local A/E firms	60
* A/E should control the project cost to be within Owner's budget.	81
* The choice of A/E should be based on the lowest fee.	83
* Decisions taken in the design phase have little influence on construction.	83
* Owner's should review design with A/E regularly.	87
* Project design should benefit from contractor's expertise.	63
* Owner(s) have a significant role in deciding on project materials and systems.	65
*I experienced a communication problem with my A/E.	57

Table 4.14 Continued:

Public Owners Response	Index
* A/E should exert every possible effort to explain plans & specifications to the Owner.	82
* Constructability reviews in design phase do worth the extra fee paid for it.	60
* In our future projects we should seek value engineering services.	78
* I believe the project team for the design was right in experience.	65
* Our project(s) didn't require us to seek any of the following services:	
. Project Feasibility	63
. Cost Control	71
. Programming	72
. Project execution manual	69
* Owner(s) should make basic unchangeable decisions during The early design stage.	40
* A/E didn't finish design on time	59
* In our future projects, I prefer to deal with the same A/E(s).	26

The results of the above table are discussed as follows:

* Regarding the type of services needed for a project, 48% of public owners believe the A/E should be employed for

basic design services ONLY. For public projects size and complexity, this is an extra ordinary response. It gives a negative indication about the owner's appreciation of the A/E role. Does this response reflect the real policy of the public owners regarding A/ services ? The analysis shall reveal this.

* When asked about the local A/Es capability, 60% of the public owners agree that the local A/E firms are capable of offering comprehensive services to public owners. It was noted that fewer percentage actually requested comprehensive services.

* Regarding the A/Es responsibility towards owner's budget, 81% of the owners indicated that the A/E is responsible to control cost within the owner's budget. Only 13% requested life cycle cost studies.

* The public owners (83% of them) disagree that the A/E selection to be based on lowest fee. Therefore, the majority have the readiness to apply other measures to evaluate and select the A/Es.

* Regarding owners' decisions at the early design stages, 83% of the public owners realize that these decisions influence the project construction significantly. This implies that they agree to stick to their firm early decisions, and give great attention to the consequences of changing these decisions.

* The public owners (87% of them) indicated that they should maintain a close contact and participation in the design stage in terms of reviews with the A/E on regular basis.

* The public owners (63% of them) indicated that design should benefit from contractors' expertise. This issue can provide the owner with an expert opinion on the buildability issues of the project.

* The public owners (65% of them) believe that the owner has a significant role in deciding on project materials and systems. This implies two issues: The first relates to owner participation where he consults with the A/E to decide on materials and systems. The second relates to the attitude of local A/E firms of being influenced greatly by the owner preferences and demands. The A/E is an expert who provides the viable choice both economically and technically. Whenever he is faced with owners' preferences that contradict with this viable choice he should be firm and explicit and explain to his client the consequences of his choice. This is not the case for the majority of local A/E firms as was revealed by an independent research study.

* The public owners (57% of them) indicated that they've experienced communication problems with the local A/Es. The public owners are represented by engineering departments. It

can be perceived that difficulty in communication is likely to happen when the public owners were represented by decision makers with little technical background used to deal with multinational A/E firms.

This percentage is a serious indicator. The reasons behind it need to be addressed. Better communication can be achieved by more organization and by encouraging regular meetings between A/E and the public owners representatives.

The public owners (82% of them) strongly believe that the A/E should exert every possible effort to explain the plans and specifications to the owner and positively participate with the owner in the revisions.

* The public owners (60% of them) support and constructability reviews in the design phase, and see it worths the extra fee paid for it.

* The public owners (78% of them) indicated that they shall seek value engineering services in their future projects. Now, only 30% of them reported that they are actually using VE services. The public owners who didn't promise to request such service need to be approached with the advantages of such service.

* The public owners (67% of them) are satisfied with the

experience of the design team. This is a promising response. Further investigations capitalized on this issue. The Owner's satisfaction with A/E experience is a key issue that shall result in their satisfaction with the outcome of the design process.

* Regarding the type of services public projects require, 63% of the public owners believe their projects didn't require feasibility studies. Feasibility is mostly geared towards economical aspects. The public projects addresses the need and the other dimensions related to on-going government policy and long term planning. Other types of feasibility could be equally important such as environmental, social, legal, and political considerations.

* Amazingly, around 70% of public owners believe their projects didn't require cost control, nor programming, nor project execution manual. This is evident in the owners' low actual demand on these services. The public owners need to investigate the potential of these services in improving project quality, cost effectiveness and performances. The above services can make the difference between project success and failure.

* Regarding the public owners willingness to stick to their early design decisions, only 40% of them are ready to do

so in spite of the fact that 83% of them indicated that such early decisions are crucial to the project success.

* Regarding A/Es delaying design, 59% of the public owners experienced such delay in completing design. This attribute partially determines the owner satisfaction and is investigated further.

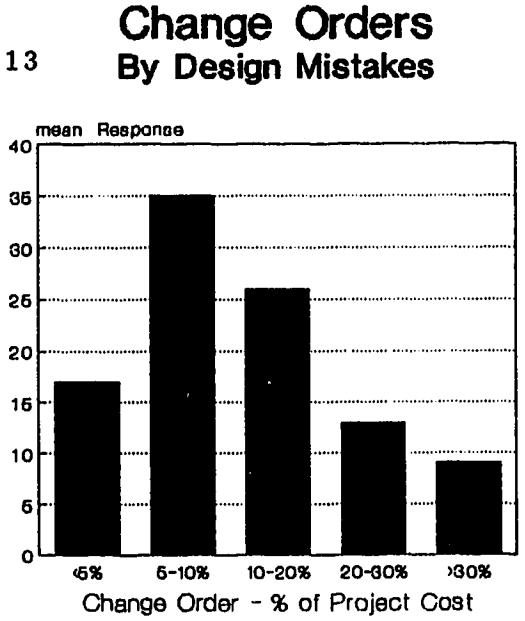
* Only 26% of the public owners indicated that they would choose the same A/E again. This is an extraordinary response. The majority are satisfied with the A/E experiences and their projects overall performance. Further investigations shall look for the causes of this low level of loyalty.

* Regarding change orders originating from design errors, table 4.15 as well as figure 4.13 present the magnitude of change orders as follows:

Table 4.15: Change Orders Originating From Design Mistakes.

Change Order Category	Response Percentage %
0 - up to 5%	17
Above 5% - up to 10%	35
Above 10% - up to 20%	26
Above 20% - up to 30%	13
Above 30%	9

Figure 4.13



It is quite serious to have such a high percentage of change orders originating from design errors. This response casts doubts around the other owners response on A/E experience, and the response on owner satisfaction with project cost effectiveness. As 65% of public owners believe that the project design team was experienced. This judgement is based on their first hand experience with the local A/E firm. An experienced team must be technically and managerially qualified to satisfy clients needs and produce a successful project. Otherwise, it will not be considered an experienced design team.

For this reason, the public owners response to other attributes that has a relation with the issue of A/E experience was cross-matched to detect and evaluate how does A/E experience compare to these attributes.

When examining that class of public owners (65%) who indicated that they are satisfied with the A/E experience they have the following characteristics:

* About 66% of them reported change orders (that can reach up to 20% of the project cost) due to design errors.

* About 50% are not satisfied with the functional performance of their projects.

* About 66% believe that the design was cost effective.

* 80% are satisfied with the aesthetics of their projects.

* About 50% believed that the design was buildable and resulted in a smooth construction process.

* About 30% experienced communication problems with A/E.

* About 25% experienced delay in finishing the design.

* About 33% of them would choose the same A/E for future projects.

* About 80% of them have a good overall satisfaction level with A/E services.

When examining the other class of public clients (35%) who aren't satisfied with the experience level of the design team, they have the following characteristics:

* About 66% had communication problems with the A/E, delay in finishing design and, change orders resulting from design errors up to 15%.

* bout 20% are satisfied with projects aesthetics, and overall design satisfaction.

* None of them is satisfied with buildability, nor cost, nor function nor prefer to choose the same A/E again.

The above data suggests that those who are not satisfied with the A/E experience are more consistent in their opinion regarding the issues that are affected by the lack of experience in the project design team. For those owners who are satisfied with the A/E experience they give contradictory response regarding key issues. A significant portion of them has change orders up to 20% of project cost resulting from design errors, or not satisfied about the buildability of the design nor about the functional performance of their projects....

Does this mean that the experienced design team could and equally could not satisfy the basic requirements and concerns of his client? There might be a difference between the respondents' judgement on his perceived needs and the legitimate requirements of the project which resulted in the above inconsistency. Or the public clients were actually harsh on their evaluation. This is a common problem regarding the appropriateness of response to subjective questions involving opinion and behavior. It is evident that the owners get more critical in their response to particular issues regarding the design. In their response to the overall satisfaction level

they were less critical in their response.

The survey revealed that 48% of public owners support the employment of A/E for basic design services only. If we know that the average public project size is 400 million SR. there is definitely a need for more services than just basic design. The same supporters (75% of them) expressed their well to employ A/E for value engineering services in their future projects. Further more, they themselves have employed A/E for services other than basic design. Those who fall in this situation apparently do not know what is value engineering in spite of the fact that it's definition was given in the questionnaire.

The same respondents (33% of the basic design supports) declared that they needed project execution manual in their projects. 60% of those public clients who promised they shall seek VE services in their future projects still support the idea of employing A/E for basic design services only!.

The percentage of consistent replies is low regarding these issues. Such variations show inconsistency that may affect overall response reliability.

The other 45% of respondents -the supporters of employing A/Es for more services other than basic design- showed consistency in the cross tabulation analysis.

The public owners questionnaire showed that 29% of owners requested value engineering (VE) services out of which 66% are satisfied with the functional performance of their projects. This suggests that the functional satisfaction is associated with value engineering. For those who didn't employ VE services, 50% are not satisfied with their projects in terms of functional performance.

The level of demand on VE is low amongst public owners. When matching those who used VE services with total project monetary value, two owners with project value below 25 million used it. The third public owner has a project size about 3 billion SR.

Another four owners having project sizes about 1 billion SR. didn't employ VE services. If the average size of the public projects is 400 million SR., then VE should become mandatory for all public projects. The present practice of demanding and employing VE is not associated with project size. The public owners leader in this regard is the ministry of defense and aviation. They are employing VE services and promoting it's use. They have total annual project size above 3 billion SR. The other two public owners who employed (VE) have smaller projects. Their case should be taken as model for all public owners in this regard.

4.5 Public Owners' Satisfaction with Design Services:

When the public owners were asked to indicate their overall satisfaction level with the design services offered to them by local A/ES, 46% of them indicated satisfaction. How does this overall satisfaction relate to the type of services they obtained from local A/E firms? The answer to this question is through cross-tabulation between the public owner overall satisfaction and type of services offered.

For that class of public owners who are satisfied with A/E services in overall sense:

* All of them employed the A/E for basic design services, specifications, and supervision.
* About 66% of them employed the A/E for quantity survey and project budgeting services.
* About 50% of them employed the A/E for feasibility, value engineering, site selection and analysis, and programming.
* About 25% of them employed the A/E for construction management services.
* About 20% of them employed the A/E for environmental studies, and life cycle costing.
* None of them employed the A/E for marketing studies.

The more services an owner demands from the A/E office for a particular project, the more he is likely to obtain a detailed design service. This doesn't suggest that overall owner satisfaction is determined by employing the above level of services. Because when looking to the other side of the coin the public owners who are not satisfied (the remaining 54%), they have similar percentages as the above category. However, 50% of them employed the A/E for supervision, construction management and quantity survey. About 33% of them employed the A/E for environmental studies, and value engineering.

The fact that the A/E is or is not employed for a certain type of service doesn't affect the satisfaction status of his employer - the public owner. However, the more services the public owner obtain from the A/E the more contact and first hand experience is gained from the A/E and consequently the more reliable the owner's judgement about his professional relationship with the A/E.

Examining that category of owners who are satisfied with the overall A/E services with their satisfaction regarding A/E experience revealed that the majority of them are also satisfied with the A/E experience. This suggests an association between the A/E experience and his ability to satisfy public owners.

Examining whether those satisfied with the services would choose the same A/E for future projects revealed that only 50% of them would do so. Are the A/E firms to understand that their choice for future projects doesn't depend on whether they've satisfied their clients or not. This can't be the case. There are other factors that contribute to A/E future choice. Cross examinations revealed that ease of communication is important. 33% of those satisfied at the end with the services experienced communication difficulties during the process. Another 25% experienced design delay. This gives the A/E a reminding advice about what determines his future selection by the public owner.

Almost all public owners who are satisfied with cost effectiveness of their project didn't require life cycle costing (LCC) from the A/E. In the other hand, most of those non-satisfied (80% of them) with their projects economics didn't require (LCC) analysis in their designs.

It was noted that 60% of the owners realize the need for cost control services for their projects, out of which 66% are satisfied with cost effectiveness of the design. However, in the real practice. only 10% ended up using (LCC) services This suggests that the public owners satisfaction regarding cost effectiveness of their projects is not determined, nor associated with using (LCC) services. Furthermore, whether the public owners believes they needs (LCC) or not bear little effect

on whether they demand it from the A/E. In reality, the number of public owners demanding (LCC) is too little to see its effect on the owners satisfaction of the cost effectiveness in their projects.

The discontinuity between what services the public owners believe are needed for the project success and what they really demand from A/E continues:

* The public owners survey showed that 17% of respondents who employed A/E for feasibility still believe their projects didn't need it.

* The survey showed that 25% of the public owners' population believe that they needed feasibility and didn't actually request it.

* The survey showed that 66% of the population declared they didn't need programming nor a pre-design service. Out of which 50% ended up requesting it.

* The survey showed that 50% of those who believed they needed project execution manual requested construction management (CM) services. Probably the public owners themselves through their engineering departments wanted to perform the CM role.

The public owners choice to employ professional CM services is not associated with the size of the projects undertaken by them. However, the number of employees in the public owner engineering department is strongly associated with projects size.

The public owners survey revealed that 46% of public owners are satisfied that the designs were buildable and resulted in a smooth construction process. Out of which, 66% believe that constructability reviews worth the extra cost paid for it. In the other hand 50% of those convinced about constructibility reviews are not satisfied with their actual projects buildability. This suggests that there is a potential for constructablity services as the majority of the owners are convinced about its benefits. Also, the other 50% of public owners need to be satisfied with the buildability of these designs.

The survey revealed that 63% of public owners realize that design should benefit from construction expertise, which is the whole idea about constructablity reviews. They themselves (80% of them) believe that those reviews worth the extra money paid for it. This shows that they have the incentive to ask for such services in their projects. Such incentive is an important step towards implementing the reviews.

Public Owners Satisfaction:

The satisfaction level of public owners about the design services offered to them by local A/E firms was measured by the owners judgement on how successful was the design in fulfilling it's function, cost effectiveness, aesthetics requirements, and buildability. The frequency of responses together with the index for each attribute is presented in table 4. 16.

Table 4.16: Public Owners Satisfaction - Frequency Response and Index.

	EXCELLENT	VERY GOOD	GOOD	ACCEPTABLE	POOR	INDEX
1. The design fulfilled the need and works functionally well with no defects.	[9]	[22]	[26]	[30]	[13]	46
2. The design was cost effective and there was no loses due to design deficiency.	[0]	[23]	[27]	[36]	[14]	40

Table 4.16 Continued:

3. The design is aesthetically pleasant and successful.	[0]	[30]	[26]	[35]	[9]	44
4. The design was buildable and resulted in a smooth construction progress.	[9]	[17]	[26]	[44]	[4]	46
5. My overall satisfaction with the design is:	[0]	[26]	[35]	[35]	[4]	46

It is evident that the owners satisfaction is moderate regarding the above attributes that constitute the overall success of the design. The owners satisfactions in overall sense is slightly higher than the average individual attributes. The owners are more critical when it comes to specific characteristics or their projects.

4.6 Measurement of Public Owners Satisfaction

The public owner satisfaction level about the design services offered to them by local A/E firms was computed individually for each respondent - public owner utilizing three methods. Two methods were based on the owners response to direct questions measuring satisfaction. The third utilizes indirect questions having great influence on satisfaction such as; A/E experience, punctuality, communication, change orders, and A/E future selection.

The following is an explanation and presentation of the three measures:

Method I: The first satisfaction level -index I- was taken from the public owners direct response to question 5 in table 4.16 which measures the respondents overall satisfaction. The mean satisfaction level for the population is 46. The

individual satisfaction levels were taken for each respondent as follows:

Excellent : Has a weigh of 4 = 100%

Very Good : Has a weight of 3 = 75%

Good : Has a weight of 2 = 50%

Acceptable: Has a weight of 1 = 25%

Poor : Has a weight of 0 = 0%

The individual satisfaction levels using method I are presented on table 4.18.

Method II: The second satisfaction level -index II- was obtained by asking direct questions about the four attributes that constitute the quality of the design namely; Function, Cost, Aesthetic, and Buildablity. Each attribute was given an appropriate weighting as indicated in table 4.17. Then each response was multiplied by the weighting then added together for each respondent individually to form the second individual index.

Table 4.17: The Weights of Quality Attributes

Attribute	Weight
Function	8
Cost	8
Aesthetic	10
Buildability	7

In order to illustrate how the satisfaction index II works, consider the following example where the public owner response was:

. Function	Excellent	Scale	4
. Cost	Acceptable	=	1
. Aesthetic	V. Good	=	3
. Buildability	Good	=	2

Satisfaction Index II = (4*8 + 1*8 + 3*10 + 2*7)/132 * 100%

= 64%

** Note: 132= 4 * (8+8+10+7)

The weights in table 4.17 were selected according to how much each attribute contribute to the owner overall satisfaction. This contribution is determined by the degree of association between each individual attribute with the overall satisfaction level as indicated by a direct question. The satisfaction attributes are presented in the order of their contribution to the overall satisfaction as follows:

Attribute	Association	Weight
Aesthetics	88%	10
Cost Effectiveness	75%	8
Function	74%	8
Buildability	68%	7

Method III: The third satisfaction level -index III-was determined from the public owners' response to five indirect questions indicative of their satisfaction. The third measure is extremely important to verify the response and convey a different perspective. The indirect questions were asked about the following issues:

1. Communication with the A/E.
2. Satisfaction with A/E experience level.
3. Level of A/E to finish design on time.
4. Magnitude of change orders originated by design errors.
5. The future choice of the same A/E.

Index III was calculated for each individual respondent by taking the average index for the above attributes. Table 4.18 presents the individual indexes for each respondent using methods I, II, and III.

The three measures of owner satisfaction are showen in table 4.19 and figure 4.14. The first measure is the most direct. The owners report their overall satisfaction on a five point interval scale. The difference between each interval is 25. The second measure is an average of four direct attributes that constitute quality. It evaluates the owners satisfaction from various dimensions, and provides less variations in the intervals because of the average.

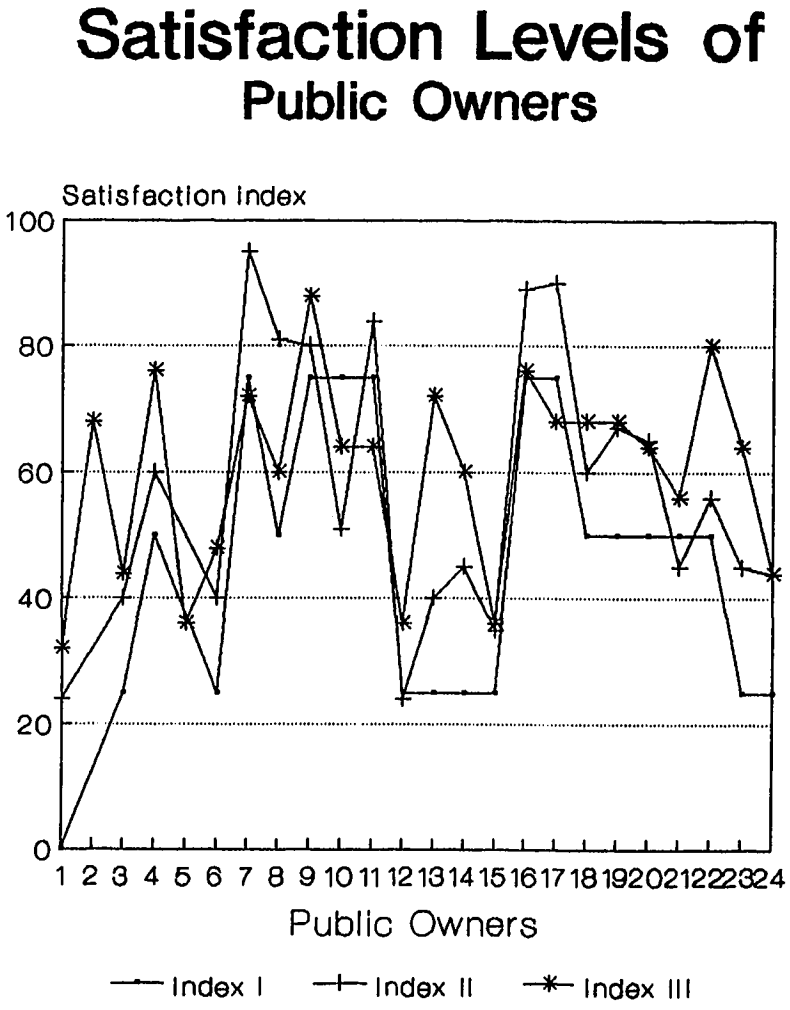
Table 4.18: Public Owners' Satisfaction Levels

Respondent Public Owner	Satisfaction Index Expressed in % Terms		
	Measure I Index %	Measure II Index %	Measure III Index %
1	0	24	32
2	-	-	68
3	25	40	44
4	50	60	76
5	-	-	36
6	25	40	48
7	75	95	72
8	50	81	60
9	75	80	88
10	75	51	64
11	75	84	64
12	25	24	36
13	25	40	72
14	25	45	60
15	25	35	36
16	75	89	76
17	75	90	68
18	50	60	68
19	50	67	68
20	50	65	64
21	50	45	56
22	50	56	80
23	25	45	64
24	25	44	44
Average	46	52	63
Ideal	100%	100%	100%

The third measure is indirect, and is composed of five attributes, each of which bears an influence on the owner satisfaction. The third measure -being indirect - is more representative and indicative of owner satisfaction than the first two measures. The reason for this is the fact that third measure examines the practical and day to day dealing of the owner with the A/E. Where the first and second measures

evaluate the end result or product which is the design service package. The public owners were specifically asked to report their satisfaction on the design services offered to them by local A/Es. Their satisfaction level is not to be measured, nor based on the actual performance of the project. The actual project performance is determined and affected by design, construction and owner intervention and interaction.

Figure 4.14



CHAPTER FIVE

SUMMERY AND RECOMMENDATIONS

5.1 Summary of The Study

The research addressed the professional relationship between the public owners and the local Architectural Engineering A/E firms. It explored the scope and demand on the services offered by local A/E firms. It assessed the degree in which these services are capable of fulfilling the public owners needs in building construction projects. The data was generated from a sample of local A/E firms in Dammam, Riyadh, and Jeddah and the total population of the public owners using two questionnaires. The data was analyzed utilizing the package of SAS (Statistical Analysis System). Indexes were used extensively to measure the A/Es and public owner characteristics and satisfaction level of the A/E design services in terms of function, aesthetics, cost effectiveness, buildability, and overall satisfaction. The research revealed some problem areas such as; delay in completing design, and high percentage of change orders originating from design errors as declared by public owners. The A/Es were concerned about the low level of owners involvement in the design, appreciation of the A/E role, and readiness to pay a reasonable fee and demand the right scope of services.

5.2 Summery of The Results

The local Architectural Engineering firm on average is handling annual projects size up to 175 Million SR. It has been in practice for 13 years, employing 91 employees most of them are college graduates holding B. Sc. degrees. The local; A/Es are divided into two groups. The first having up to 10 employees, and the second having over 100 employees. The projects are mainly residential and commercial. The A/Es are selected mostly by competitive bidding, and compensated by fixed fee method. The public clients are the major users of the local A/Es design services.

All the public owners have engineering departments with an average number of 40 employees. The majority of them have in-house design capabilities. They handle projects of an average annual volume up to 400 Million Saudi Riyals.

As reported by them, the public owners employ local as well as multinational A/Es. They mostly review design thoroughly with the A/E, and insist that the A/E should not violate budget boundaries. They mostly have well defined project requirements at the briefing stage. they respect and trust the A/Es professional advise, and hold the A/E responsible for design errors.

5.2.1 Profile of Local A/E Services

The local A/E firms currently offer a wide multitude of services to public and private clients. The services range from basic design to a full scale comprehensive services. The scope of services is actually bound by the project size and requirements as well as owners demands, and fee.

Public owners generally demand a wider scope of services as compared to private owners. The public clients traditionally demand: Basic design services, Specifications, and Site supervision.

The demand on the other services is limited. Public clients show readiness to employ the A/Es for more services such as construction management, cost control, value engineering, and pre-design services. The clients believe that the local A/Es are capable of providing full range of comprehensive services. They also believe that their projects being large and complex enough do require these services.

The public clients showed - in general - an appreciation of the A/E role. They also showed faith in the A/E capabilities in terms of design team experience. The most important fact is that they believe their projects required them to use services beyond what traditionally the local A/Es had been employed to do.

5.2.2 Problem Areas in the A/E Client Relation

The problem areas in the A/E public owner relation is considered from the two groups points of view. For the public owners, the major problem is the high percentage of change orders originating from errors and mistakes in the design. The majority of public owners reported change orders originating from design errors above 5% of project value, and over 20% in some cases. The problem regarding change orders explains the owners relatively low satisfaction level of the cost effectiveness of their designs as compared to other attributes such as functional performance and buildability.

Other problems - with less severity - are communication, delay in design completion resulting in the fact that the majority of public owners would not choose the same A/E again.

From the A/E point of view the problem areas arise form the fact that the majority of his clients overlook the significance of design stage, don't employ the A/E for the needed scope of services, low level of participation in the design, and are not prepared to pay a reasonable fee for his services. This signals the public owners low level of appreciation of the A/E role in achieving overall project success.

The research showed high association in the public owners response regarding their satisfaction about the experience

of the design team and their overall satisfaction about the design. However only 50% of those who are satisfied would choose the same A/E for future projects, and 30% experienced communication problems.

5.2.3 Are Public Owners Satisfied With A/E Services ?

Owners' satisfaction was measured by four measures. Three of them from the owners' perspective directly and indirectly averaging to a satisfaction index level of 56%. The fourth measure from the A/E perspective was somewhat higher (62%) for obvious reasons.

The public owners response to their satisfaction about the design services was consistent when comparing the three measures. In general there is little variation between the owners response and the A/E response regarding owners' satisfaction. But both responses were conservatively moderate. This is probably due to the nature of the issue as few respondents would go to the extremes. Never the less, the overall conclusion is that the public owners are moderately satisfied with the current local A/E services. There is a room for improvement especially in the area of cost effectiveness of the design, and the issue of change orders which needs to be assessed separately and extensively by future research.

5.3 Recommendations

The core of this research is the issue of public owners satisfaction with the design services. Owners satisfaction reflects design success in terms of function, cost effectiveness, aesthetics, and in overall sense. The research revealed that owners are moderately satisfied with the above attributes. The recommendations are bound by the scope of the research and peculiar to the data generated and analyzed. Based on this guideline the following recommendations are made:

1. The public owners need to establish, and by careful examination the needed scope of services for each project at the very beginning. Failing to do so can result in an under-designed project. This can be achieved if the public owners view their project as an investment opportunity. They need to look at the long term implications of employing services such as per-design, project execution manual, Value engineering and construction management. The research showed that the local A/Es -in general- are capable of handling these services. The public owners clearly declared that they haven't been employing the above services in spit of the fact that their projects needed them.

2. The owners -relatively- low satisfaction level regarding the issue of cost effectiveness of the design together with the problem of change orders due to design deficiency. Both can be improved by employing life cycle cost analysis, and constructibility reviews involving materials, methods, and systems. The optimum choice then can be based on life cycle cost considerations, and practical construction expertise.

3. The public owner communication with the A/E need to be improved by having more participation from the public owners, holding regular meetings especially at the early stages of the design, and review design progress thoroughly with the A/E. Such actions can generate a smooth flow of the design process resulting in less delay.

Appendix I

- Local A/Es Questionnaire

- Public Owners Questionnaire

A QUESTIONNAIRE FOR DESIGN OFFICES IN SAUDI ARABIA

Filling in this questionnaire will take 15 minutes of your valuable time. The questions refer to the building construction projects finished and/or under-construction that your office designed fully or partially within the last 15 years. For the purpose of this research please, note the following definitions: :

Owner: An entity either public, private or individual requesting or paying for the consultancy service.

A/E : The architect / engineer firm providing consultancy services to the owner.

Basic design services : The involvement of the A/E in design services producing a set of drawings only.

Comprehensive Services : Refer to the planning, pre-design services, design and supervision.

Value Engineering : The formal VE review of the design of some other A/E on a project.

Construction Management : The professional agency service provided by an independent professional ie. A/E office advising the owner, and coordinating the project from inception to use.

Pre- design services : The services required before design such as feasibility, programming, site selection and analysis.

Environmental studies : Positive and/or negative impact of the project on the environment.

Constructability reviews : The reviews performed within the A/E firm to integrate design with construction.

Client's Need : The A/E understanding of the Client's requirements and needs where he tries to fulfill in the design.

April 20 1991

Dear Sir,

We are currently conducting a research on the professional relationship between the design offices in the kingdom and the clients or owners of building construction projects using the services of local consultants.

A copy of the questionnaire was mailed to you early in January. We didn't receive your valuable reply probably due to the late events. We believe that your participation is vital to the success of this research project which should hopefully provide needed information on the subject matter to the advantage of all parties participating in the construction industry.

The information you provide shall be used for academic purposes only, and shall be treated with secrecy. Please, note that the respondent to the questionnaire need to be the principle of the firm or the designer.

Kindly return the questionnaire by mail or FAX to the following address:

Prof. Sadi Assaf
King Fahad University of Petroleum and Minerals
P.O. Box 680
Dhahran 31261

FAX 03 8950841

We thank you very much , and best regards..

Dr. Sadi Assaf

Associate Prof.
Construction Engineering & Management

PART I

The following questions are intended to determine your office profile. Please, tick the appropriate box.

1. The Projects your office undertake are:

		ALWAYS	MOSTLY	SOMETIMES	SELDOM	NEVER
a.	Civil projects	[11]	[17]	[43]	[20]	[9]
b.	Industrial projects	[9]	[3]	[40]	[31]	[17]
c.	Governmental buildings	[6]	[25]	[42]	[14]	[14]
d.	Commercial buildings	[6]	[33]	[50]	[8]	[3]
e.	Educational buildings	[6]	[14]	[43]	[23]	[14]
f.	Residential buildings	[33]	[33]	[28]	[3]	[3]
g.	Other (specify) _____	[ ]	[ ]	[ ]	[ ]	[ ]

_____

2. The services your office offer are:

a.	Basic design services	[43]	[34]	[14]	[6]	[3]
b.	Comprehensive services	[31]	[44]	[22]	[0]	[3]
c.	Construction Management	[8]	[19]	[50]	[17]	[6]
d.	Feasibility Studies	[6]	[6]	[46]	[23]	[20]
e.	Value Engineering	[3]	[0]	[29]	[41]	[27]
f.	Quantity Survey	[20]	[9]	[31]	[34]	[6]
g.	Life Cycle Cost Analysis	[0]	[0]	[15]	[23]	[62]
h.	Environmental Studies	[3]	[3]	[14]	[29]	[51]
i.	Site Selection and Analysis	[6]	[9]	[34]	[28]	[23]
j.	Project budgeting	[17]	[6]	[28]	[28]	[20]
k.	Project Marketing Studies	[0]	[6]	[19]	[25]	[50]
l.	Other (specify) _____	[ ]	[ ]	[ ]	[ ]	[ ]

3. Your clients are :

		ALWAYS	MOSTLY	SOMETIMES	SELDOM	NEVER
a. Public	* Governmental	[8]	[40]	[27]	[11]	[13]
b. Semi-public	* Aramco	[5]	[5]	[16]	[16]	[57]
	* Royal Comm.	[5]	[5]	[30]	[14]	[46]
	* Petromine	[3]	[3]	[27]	[24]	[42]
c. Private	* Corporate	[14]	[28]	[47]	[6]	[6]
	* Individual	[31]	[25]	[31]	[11]	[3]

4. Your office gets new projects through :

a. Design competition	[8]	[5]	[54]	[27]	[5]
b. Negotiation	[19]	[22]	[38]	[19]	[3]
c. Competitive bidding	[11]	[35]	[43]	[5]	[5]
d. Nomination	[11]	[22]	[28]	[28]	[11]
e. Other (specify)_____	[ ]	[ ]	[ ]	[ ]	[ ]

_____

5. Your office gets compensated by :

a. Fixed fee (lump-sum)	[31]	[50]	[17]	[3]	[0]
b. Percentage of project cost	[0]	[11]	[16]	[32]	[41]
c. Hourly rate	[11]	[5]	[38]	[19]	[27]
d. Other (specify)_____	[18]	[0]	[36]	[9]	[30]

_____

PART II

This part is intended to measure the Owner's understanding and appreciation of the construction process, and his level of satisfaction with the services offered to him by A/E. Please tick the appropriate box.

	ALWAYS	MOSTLY	SOME-TIMES	SELDOM	NEVER
*Owner(s) approach A/E with well defined project requirements.	[0]	[27]	[39]	[33]	[0]
*Owner(s) demand pre-design services.	[11]	[26]	[17]	[37]	[9]
*Owner(s) review design thoroughly with the A/E.	[14]	[40]	[34]	[11]	[0]
*Owner(s) seek second professional opinion on the design before approval.	[0]	[6]	[29]	[54]	[11]
* Owner(s) insist on A/E to keep design within budget.	[11]	[40]	[37]	[9]	[3]
* Owner(s) demand basic design services only.	[0]	[26]	[43]	[31]	[0]
* Owner(s) keep contact with A/E during construction even if A/E is not involved in supervision.	[6]	[14]	[46]	[26]	[9]
* Owner(s) are prepared to pay a reasonable fee to get accurate and detailed design.	[0]	[11]	[26]	[46]	[17]
* Owner(s) conduct constructability reviews on the design.	[0]	[11]	[37]	[40]	[11]
* Owner(s) overlook the significance of the design stage in	[3]	[24]	[50]	[24]	[0]
* Owners hold A/E responsible for design errors.	[54]	[29]	[14]	[3]	[0]
* Owner(s) respect and trust the professional advice of the A/E	[6]	[49]	[31]	[11]	[3]
* Owner(s) - in general - are satisfied with A/E services.	[17]	[49]	[29]	[6]	[0]
* Owner(s) demand additional services that can't be provided within the A/E office expertise.	[11]	[0]	[40]	[37]	[11]

PART III

7. Please fill in the following information about your office.

a. Name of the office: _____

b. Current no. of employees: _____6 - 650_____

c. Years of practice in the Kingdom: ____1 - 25_____

d. Annual average SR. value of the project your office is involved with: SR. ____1 Million - 3 Billion_____

e. Type of Ownership _91__ Saudi
__6__ Joint Venture (Saudi/ Saudi)
__3__ Joint Venture (Saudi/ Foreign)

f. Please indicate the number of your employees in each level of eduction :

Level of education	No. of employees
Ph. D.	_____50%_____
M. Sc.	_____66%_____
B. Sc.	_____100%_____
Diploma (draftsmen)	_____100%_____

Other (Specify) _____

A QUESTIONNAIRE FOR PUBLIC OWNERS OF BUILDING PROJECTS IN SAUDI ARABIA

Filling in this questionnaire will take 15 minutes of your valuable time. The questions refer to the building construction projects finished and/or under-construction within the last 15 years. For the purpose of this research please, note the following definitions :

Owner : The public governmental agency represented by the projects department of that agency.

A/E : The architect / engineer firm providing consultancy service to the owner.

Basic design services : The involvement of the A/E in design services only producing a set of drawings.

Comprehensive Services : Refer to the planning, pre-design, design and supervision services.

Value Engineering : The formal VE review of the design of some other A/E on a project.

Construction Management : The professional agency service provided by an independent professional ie. A/E office advising the owner, and coordinating the project from inception to use.

Pre- design services : The services required before design such as feasibility, programming, site selection and analysis....

Environmental studies : Positive and/or negative impact of the project on the environment.

Constructability reviews : The reviews performed within the A/E firm to integrate design with construction.

Client's Need : Client's requirements and needs that are conveyed to the A/E in order to fulfill in the design.

April 20 1991

Dear Sir,

We are currently conducting a research on the professional relationship between the design offices in the kingdom and the public clients who had constructed or currently constructing building projects using the services of local consultants.

A copy of the questionnaire was mailed to you early in January. We didn't receive your valuable reply probably due to the late events. We believe that your participation is vital to the success of this research project which is intended to provide needed information on the subject matter to the advantage of all parties participating in the construction industry.

We assure you that the information you provide shall be used for academic purposes only, and shall be treated with secrecy. Please, note that the respondent to the questionnaire need to be an architect or engineer from your engineering department, preferably the department head.

Kindly return the questionnaire by mail or FAX to the following address:

Prof. Sadi Assaf
King Fahad University of Petroleum and Minerals
P.O.Box 680
Dhahran 31261

FAX 03 8950841

We thank you very much , and best regards..

Dr. Sadi Assaf

Associate Prof.
Construction Engineering & Management

PART I

1. What type of building(s) did you build? Please indicate total SR. value for each :

Residential [44] _____ SR Commercial [12] _____ SR

Industrial [12] _____ SR Educational [20] _____ SR

Other (specify) _____ [ ] _____ SR

2. What is the scope of services you obtained from the A/E? Please tick the appropriate box(es):

- Basic design services	[96]	- life cycle costing	[13]
- Specification	[88]	- Environmental studies	[21]
- Supervision (site inspection)	[75]	- Site Selection and Analysis	[38]
- Construction Management	[29]	- Project Budgeting	[58]
- Feasibility Study	[38]	- Marketing Studies	[8]
- Value Engineering	[29]	- Programming	[46]
- Quantity Survey	[63]	- Other(s) _____	[ ]

3.How did you go about selecting the A/E?

- Design Competition [39] - Direct Negotiation [48]

- Competitive Bidding [66] - Nomination [30]

- Other (specify) _____

4. How did you compensate the A/E? Please indicate the total SR value of the fee.

- Fixed Fee [77] _____ SR

- % of Project Cost [23] _____ SR

- Hourly Rate [14] _____ SR

- Other (specify) [ ] _____ SR

PART II

5.Please check your level of agreement with each statement :

	STRONG AGREE	AGREE	UNDE- CIDED	SOMEWHAT AGREE	DISAGREE
* Owner(s) should employ A/E for basic design services only.	[24]	[12]	[12]	[36]	[16]
* Owners can get comprehensive services from local A/E firms	[20]	[40]	[20]	[0]	[0]
* A/E should control the project cost to be within Owner's budget.	[52]	[36]	[0]	[8]	[4]
* The choice of A/E should be based on the lowest fee.	[71]	[13]	[4]	[0]	[13]
* Decisions taken in the design phase have little influence on construction.	[70]	[13]	[0]	[13]	[4]
* Owner's should review design with A/E regularly.	[68]	[24]	[0]	[4]	[4]
* Project design should benefit from contractor's expertise.	[36]	[20]	[8]	[32]	[4]
* Owner(s) have a significant role in deciding on project materials and systems.	[28]	[40]	[8]	[12]	[12]
*I experienced a communication problem with my A/E.	[23]	[31]	[5]	[32]	[9]
* A/E should exert every possible effort to explain plans & specifications to the Owner.	[60]	[24]	[4]	[8]	[4]
* Constructability reviews in design phase do worth the extra fee paid for it.	[24]	[44]	[4]	[4]	[24]
* In our future projects we should seek value engineering services.	[44]	[32]	[20]	[0]	[4]
* I believe the project team for the design was right in experience.	[25]	[38]	[17]	[13]	[8]

	STRONG AGREE	AGREE	UNDE- CIDED	SOMEWHAT AGREE	DISAGREE
* Our project(s) didn't require us to seek any of the following services:					
- Project Feasibility	[42]	[8]	[13]	[33]	[4]
- Cost Control	[56]	[12]	[0]	[24]	[8]
- Programming	[64]	[0]	[4]	[24]	[8]
- Project execution manual	[50]	[13]	[4]	[29]	[4]
* Owner(s) should make basic unchangeable decisions during The early design stage.	[17]	[25]	[4]	[8]	[46]
* A/E didn't finish design on time	[8]	[32]	[8]	[32]	[0]
* In our future projects, I prefer to deal with the same A/E(s).	[0]	[17]	[4]	[44]	[35]

* Please, indicate the magnitude of change order originated by design deficiency.

0-5%	[17]	5-10%	[35]		
10-20%	[26]	20-30%	[13]	Above 30%	[9]

7.Please indicate your level of satisfaction with the services you obtained from the A/E in terms of the following:

	EXCEL- LENT	V.GOOD	GOOD	ACCEPT- ABLE	POOR
- The design fulfilled the need and works functionally well with no defects.	[9]	[22]	[26]	[30]	[13]
- The design was cost effective and there was no loses due to design deficiency.	[0]	[23]	[27]	[36]	[14]
- The design is aesthetically pleasant and successful.	[0]	[30]	[26]	[35]	[9]
- The design was buildable and resulted in a smooth construction progress.	[9]	[17]	[26]	[44]	[4]
- My overall satisfaction with the design is:	[0]	[26]	[35]	[35]	[4]

PART III

8) Please fill in the following information about your department:

* Name of the public organization _____

* Does your organization have a project department ?

Yes [100] No [0]

If yes please :

provide the current number of employees __20 - 120___, and

Indicate if you have in-house engineering design capabilities ?

Yes [64] No [0]

* Total SR value of the building projects under construction :

_____ SR

* Approximate total SR value of building projects constructed within the last five years _____ SR

APPENDIX II

PROJECTS BUDGET APPROPRIATIONS - 1989 (MILLION SR)

* Ministry of Higher Education	1.8*
1) KFU	8.5
* Ministry of Education	600.6*
2) King Saud University	151.5*
3) Islamic University	15.7
* Girls Schools	174.0*
4) Girls Colleges	21.8
5) Um-Ul-Qura University	108.4
6) Mohammed Ibn Saud University	189.0
7) KFUPM	31.4
8) King Abdulaziz University	501.4
9) Health and Red Crescent	700.0
10) Labor and Social Affairs	19.9
11) Municipality and Rural Affairs	2266.3 + 4
12) Pilgrim and Endowments	91.4
13) Roads and Parks	2019.0+4
14) Railways	40.0
15) P.T.T.	594.1+4
16) Civil Aviation and Saudi Airline	200.0
17) Agriculture and Water	1561.0
18) Finance	204.6
19) Commerce	34.6
20) Industry and Electricity	1356.5
21) Petroleum and Mineral Resources	170.9
22) Information	89.7
23) Foreign Affairs	128.3
24) Interior	1271.3

* : Public Organizations not using A/E Services

** : Public organizations with branches in four cities in the Kingdom other than Riyadh.

Source : Ministry of Finance and National Economy "Statistical Year Book", 25th Edition 1989, P. 565.

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